SOIL CONSERVATION

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UNITED STATES DEPARTMENT OF AGRICULTURE · WASHINGTON

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SOIL CONSERVATION

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WELLINGTON BRINK EDITOR

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Pictured above: A dredge at work in an Eastern seaport.

Sedimentation in a Great Harbor

By L. C. GOTTSCHALK

History holds many examples of once prosperous ports and harbors which declined and disappeared as a result of sedimentation. Adria in Italy, which gave its name to the Adriatic Sea, was an important seaport in the time of Caesar Augustus. It is now 20 Italian miles inland. Tarsus in Cicilia, once visited by Cleopatra's fleet, is now 10 miles inland from navigable waters. Surat, once the leading commercial center of India, dropped in population from 800,000 inhabitants in 1797 to 80,000 in 1847, because its port on the Tapti River became filled with sediment. Historians, geologists, and engineers alike have been almost universally guilty of attributing the rapid filling of these ports to the inexorable forces of nature. They have failed to perceive the vast changes in rates of erosion brought about by man's deforestation and his agricultural use, or misuse, of the land on tributary watersheds.

Few persons, perhaps, realize that many ports of importance in the Colonial era of our own country suffered a similar fate, or that many of our major ports of today function only because of continuous and expensive dredging operations. In the Chesapeake Bay area more than a dozen important Colonial settlements in Maryland and Virginia became ghost towns when ships could no longer reach their landings. Joppa Town on the Gunpowder Falls; Elk Ridge Landing on the Patapsco; Piscataway on Piscataway Creek; Bladensburg on the Eastern Branch of the Anacostia River; Port Tobacco on Port Tobacco River; Dumfries on Quantico Creek—all these and others fell into decay when their navigation channels became filled with sediment.

Rapid sedimentation in the embayments and navigable rivers of the Eastern Seaboard is an abnormal condition that developed after white men settled this region. Both historical and geological evidence indicates that the preagricultural silting of tidal estuaries was very slow. There is a startling contract between what one sees along the Potomac River today and its appearance in 1634, as thus described by Father White, an early missionary to the Indians:

> This is the sweetest and greatest river I have ever seene, so that the Thames is but a little finger to it. There are noe marshes or swampes about it, but solid firme ground, with great variety of woode, not choaked up with undershrubs, but commonly so farre distant from each other as a coach and fower horses may travele without molestation. The soyle is so excellent that we cannot sett down a foote, but tread on Strawberries, raspires, fallen mulberrie vines, acchornes, walnutts, saxafras, etc. and those in the wildest woods. The ground is commonly a black mould above, and a foote within ground of a readish colour. All is high

Editor's Note.—The author is associate geologist, sedimentation section, Soil Conservation Service, Washington, D. C.

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woods except where the Indians have cleared for corne. It abounds with delicate springs which are best drinks. * * *

The rapid exploitation of this country for tobacco culture resulted in widespread and severe soil erosion even prior to 1700. Several ports had already become ghost towns by this date due to the effects of soil erosion. Of the many original towns established along the shores of the Chesapeake Bay during Colonial times only one—Baltimore—ever developed into a great seaport. The history of its long and costly battle with sedimentation to achieve and maintain its present status is an epic of the effects of uncontrolled erosion since the date of wholesale land clearing and cultivation more than two centuries ago.

Baltimore was officially designated a port of entry by the General Assembly of Maryland in 1706. Within 40 years it became the most populous and wealthy town of the Province. It was incorporated as a city in 1796. Today it is the seventh largest city in the United States and is known the world over as a great industrial center and shipping port. Its harbor is one of the busiest on the eastern coast, with a normal water-borne commerce of 18,000,000 tons annually, of which 30 per cent is foreign trade.

What is generally called Baltimore harbor consists of the parent estuary of the Patapsco River and the arms formed by minor tributaries. When Captain John Smith first saw the Patapsco, in 1608, the limit of open tidewater was 7 miles farther inland than it is today, and to him it must have presented the appearance of an excellent harbor. Indeed, the first landing established on the Patapsco estuary was near the head of navigation at a point called Elk Ridge, which became a prosperous town before the first house was erected in Baltimore. Ships sailed to Europe from Elk Ridge Landing, loaded with tobacco and other products.

In 200 years or more, the head of navigation has been pushed progressively downstream from Elk Ridge Landing to the Hanover Street Bridge at Baltimore, a distance of six and three-quarters miles. As late as 1845, according to charts of the U. S. Coast and Geodetic Survey, the maximum depth of water at mean low tide immediately below the bridge and adjacent to the left bank of the stream was 17 feet. By 1898 this depth had been reduced by sedimentation to 3½ feet, and by 1924 to about 6 inches. Dredging near the mouth of the Patapsco River several years ago recovered a bottle labeled in 1905 from beneath 5 feet of sediment.

Baltimore Town was founded at the head of the cove formed by Jones Falls. Originally the cove was called "Coles Harbor," but later it became known as "the basin." Sedimentation in the basin apparently was active by the time the town was laid off, for a plan dated 1730 shows extensive alluvial deposits, known as Harrison's Marsh and Steiger's Meadow, at the mouth of Jones Falls east of the town. The basin has been changed extensively as well as maintained for two centuries by dredging operations.

Jones Falls drains an area of 50 square miles of Piedmont soils, and cascades down the "fall line" directly into the basin, carrying large volumes of sediment from the cultivated lands above during each flood. Early accounts of Baltimore carry detailed descriptions of the numerous and devastating freshets which occurred on this stream. Mill dams and bridges were washed out periodically while the flood waters carried parts of buildings, carts, whiskey casks, as well as sediment, into the basin.

Sedimentation in the basin received official cognizance as early as 1753, for in this year it was enacted that:

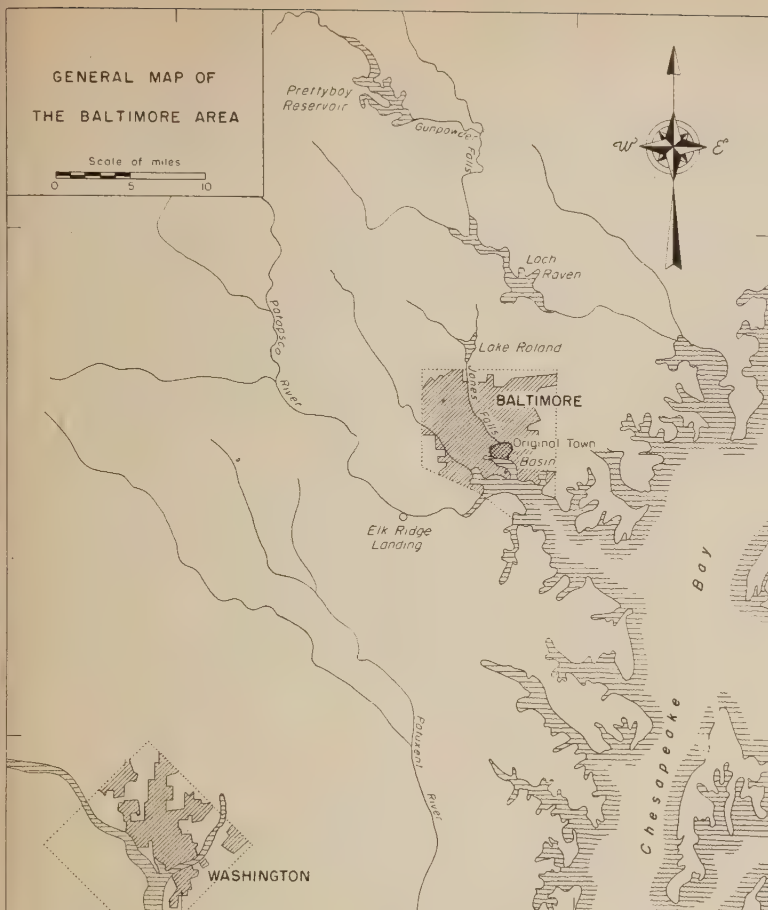
> * * * no earth, sand or dirt was to be thrown into or put upon the beach or shore of the Patapsco River, or any navigable branch thereof below high-water mark, unless secured by stone walls, dove-tailed log-pens, &c., from washing into the river, under a penalty of five pounds of current money.

During the period 1750 to 1764 boom town construction took place about the port. Numerous private wharves were built, some a thousand feet or more in length. In 1753 a shipyard was in operation in the bend of Jones Falls north of Baltimore town. At that time, there must have been sufficient depth in the channel of Jones Falls, as it meandered through Steiger's Meadow and Harrison's Marsh, to permit passage of completed ships to the basin and finally to the estuary of the Patapsco. The area above the basin has long since been filled in and the famed Battle Monument now stands on the site of the old shipyard.

A visitor to Baltimore in July 1762 wrote:

> * * * There are 2 Bridges over the creek [Jones Falls] which Joyns the 2 Parts of the Town together the Creek so shoal that only Boats or Flats can go up, & runs such a short distance in the Country that there is but very Little Currant to keep it clear so that its my Opinion both that & Bason to the S. of the Town must in a Few Years be Choak'd up Except a small Stream that the Creek which they call the Falls will keep open sufficient perhaps for Flat Bottom Craft & in that case the Sea Trade will draw down to a point Call'd Fells Point where the Shipping now Lye there being at this time 3 Ships & a Snow from London Loading with Tobacco.

His prediction was fulfilled, for the sea trade did finally draw down to Fells Point, where, as late as 1800, there was still a depth of 18 feet. In 1783, port wardens were appointed to make a hydrographic survey of the basin, harbor, and Patapsco River to determine the depth and course of the channel and provide for cleaning it. To defray expenses, one penny per ton was levied against every vessel entering or clearing the harbor. The hydrographic sur-



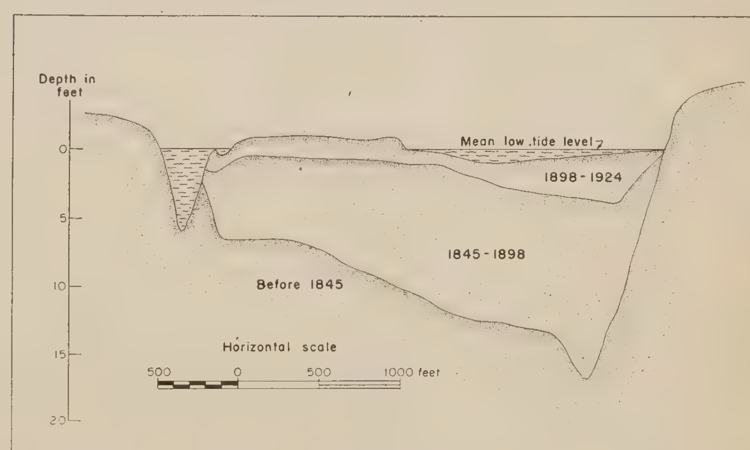
vey which was completed in 1799, showed that the water in the basin was only 8 or 9 feet deep.

Chroniclers have given Baltimore credit for developing the first "mud machine." This is probably in reference to the work done by the enterprising Ellicotts of flour mill fame, who, in 1783, extended their wharf by dredging sediment from the bottom of the port and using it for fill. Their equipment consisted of a drag with a team of horses and iron scoops with windlass.

By 1799 there were 170 warehouses in Baltimore. Fifty capital merchant mills, a powder mill, two paper mills and several furnaces and forges were located within 18 miles of the town. The value of exports amounted to more than $12,000,000 annually and the arrivals and clearances of ships, brigs, sloops and schooners and "bay craft" were counted in the thousands, for Baltimore had become the third commercial city of the United States.

With the increase in number and size of vessels, it became imperative that the navigation channels be improved and kept open. In 1815, the city authorities passed a resolution to sanction deepening of the bed of Jones Falls. The Federal Government began dredging operations in Baltimore harbor in 1836. In 1852 the Fort McHenry channel from the city limits to a point just below Fort Carroll, and the Brewerton channel from this point to deep water in the Chesapeake Bay, were dredged by the Federal Government in cooperation with the city of Baltimore. These channels, when completed, were 150 feet wide and had a minimum depth of 22 feet. They were enlarged in 1872 to provide a depth of 24 feet, a width of 400 feet in the lower end of the channel and 250 feet in the upper end. By 1881, thirty years after original dredging began, the Brewerton channel was found to be filling rapidly with sediment. Finally it was abandoned entirely and a new channel dredged, which followed the natural thalweg of the Patapsco River. The cost of the new channel was $1,250,000 and subsequent enlargement of it in 1896 cost another $2,250,000.

During the past 100 years the Federal Government alone has removed more than 111,000,000 cubic yards of material from Baltimore harbor, at a cost of nearly $17,000,000. Of this amount, $12,000,000 has been for new channels, necessitated in part by silting of old channels while $5,000,000 has been for strictly maintenance dredging or removal of sediment from existing channels. In addition, a substantial amount, probably measured in terms of millions of dollars, has been spent by private interests and by the City of Baltimore for channel improvement and maintenance. As early as 1852, Baltimore had in operation a dredging machine reported to have cost $70,000. In 1872, 13 dredges were in operation at one time in Baltimore harbor.



Sedimentation of the Patapsco River arm of Baltimore Harbor near Hanover Street bridge.

The cost to the Federal Government of maintenance dredging in Baltimore harbor from 1934 to 1941 was over $1,000,000, involving the removal of nearly 15,000,000 cubic yards of sediment. The amount of required maintenance dredging in this harbor appears to be on the rise, for the Patapsco River sediment, which formerly was deposited, to a large extent, in that part of the Patapsco estuary between Elk Ridge Landing and the present harbor, now has almost completely filled this natural basin.

Soil erosion in the watersheds tributary to the Patapsco Bay undoubtedly accounts for the major

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Fish and Farms Suffer when the Maumee Runs Brown

1. Erosion following heavy rains in April 1944; 3 percent grade. This is south of Ohio 81, west of Allentown, in Allen County, Ohio.

2. Wave-notched south shoreline of Sandusky Bay, Erie County, as seen in April 1944.

3. Gullying from barnyard and stock lane beside Bean Creek. Williams County, spring of 1944.

4. South shore of Sandusky Bay, showing removal of soil by waves; summer of 1943.

5. Hog wallow ruined creek bank in foreground; fence-protected shrubby bank presents contrast. Bean Creek, April 1944.

6. Turfed 4-to-1 sloping ditch bank beside U. S. 127, south of Paulding, Ohio. Foreground turf has been burned over. April 1944.

In this article the director of a famous biological laboratory points to the relationship between soil erosion and the valuable fish resources of Lake Erie.

By **THOMAS H. LANGLOIS**

The flat lands of the northwestern section of the state of Ohio, once the bed of glacial Lake Maumee, were covered with swamp forests in the early eighteen hundreds. Pioneer settlers passed the area by as one where the fever and ague were prohibitive to human health. The ditch-digging Irish immigrants of the 1850's changed conditions, draining off the brownish swamp waters into the tributaries of the Maumee River and clearing off the low-land forests. The Germans who came to Ohio in great numbers from 1860 to 1880 took over the area, and their descendants now form the bulk of the population of this section of Ohio.

The land is so nearly level that the annual rainfall of 36 inches makes agriculture impossible unless runoff is accelerated. The area is a maze of ditches which are fed by bedding furrows and field tiles, and the rich farms produce great quantities of corn, oats, wheat, soy beans, sugar beets, and clover. Unfortunately, the methods used to produce some of these crops leave the soil without cover during critical rainfall periods, and a huge loss of some of the richest soil in our country is occurring. This is appalling to people who recognize the soil as the basis of our national economy, and it should become a matter of grave concern to the husbandmen of the area.

The material lost from the surface of these flat, rich farms is carried by the water from the ditches and small creeks into the larger branches, and it goes down the Maumee, Portage, and Sandusky rivers into the west end of Lake Erie. All of these streams have been widened where they enter the lake into broad, flat, estuarial bays, and the silt carried into these bays during the last two or three decades has greatly changed the physical and biological conditions.

Within historic times these bays have been famous duck feeding grounds and nesting areas, and they have been of inestimable importance as breeding and nursery areas for many of the valuable food fishes of Lake Erie. Submerged beds of aquatic vegetation were then abundant throughout the bays, and they played an important role in producing the multitudious forms of insects, worms and snails which young fishes require for food. They also served to stop waves from violently cutting away the shores of the bay, and stirring up the bottom mud.

There is a delicate balance between aquatic vegetation and turbidity, and this balance can shift to favor either side of a very real conflict. Aquatic vegetation thrives in clear water and it tends to maintain clear water by holding down the bottom sediments, by preventing wave cutting of shore lines, and by filtering materials out of suspension in the water. Turbidity works for greater turbidity by smothering and shutting the light away from the vegetation. When the vegetation has been killed off, the bottom materials are brought up into renewed suspension, while the unimpeded waves cut back the shorelines and add new materials to roil the waters further.

In the bays of the southwest end of Lake Erie, the balance has shifted to favor turbidity. The heavy silt loads of the streams entering these bays has smothered and eliminated aquatic vegetation. The bottoms now are brought up with each strong wind, and the waves are cutting the shorelines back with disastrous effects. In Sandusky Bay, an early record shows Eagle Island on the tax duplicate as having 149 acres. In 1944 there is about one acre left, the rest having been spread over the bottom of the bay or carried on out into the open lake. One place under observation on the south shore of Sandusky Bay is being cut back by waves as much as 20 feet per year, and has recently taken out the bayside road. Maumee Bay has been made a near biological desert in the same way, and so has the mouth of the Raisin River, nearby in Michigan.

These effects are not limited to the bays mentioned here. The muddy waters of these south shore streams reach out around the lower islands of the Erie archipelago. The turbidity of the water between South Bass Island and Rattlesnake Island has been found to vary directly with the amount of water discharged into the lake by the west end streams during the spring months which are so critical in the life of all species of fishes in Lake Erie.

The commercial catch of food fishes in the Ohio waters of Lake Erie has shown the effects of this land misuse up the valleys of the tributary streams. Until 1924 the mainstay of the fishery was the herring, a species which feeds throughout its entire life span on small floating organisms (plankton). These small plants must have sunlight, and light cannot penetrate roily waters. Normally, these small plants and small animals reach a peak of abundance during the spring months when most fish eggs hatch, and

Editor's Note.—The author is director of the Franz Theodore Stone Laboratory, Put in Bay, Ohio.

when food for the young fishes must be abundant or the young do not survive. The increasing silt loads of these west-end streams have changed conditions so radically that the herring has been eliminated as a commercial species, and the perch, which requires areas of vegetation for spawning for the growth of its young, has greatly diminished in abundance.

The yellow pickerel is somewhat more tolerant but shows the effects of changing conditions in different ways. The rapids of the Maumee River above Toledo were once a great spawning area for yellow pickerel, and the pickerel run from the lake up the Maumee and several other west-end streams to spawn shortly after the ice goes out in the spring. During spring seasons of low rainfall, such as 1926 and 1941, the streams run clear and great numbers of young pickerel are produced, but during the more usual years when the streams run high during March, April, and May, with melting snow and heavy rainfall, few young fish are produced. Naturally the catch by the commercial fishermen drops off after a series of years like this, and unfortunately they are then blamed for depletion by over-fishing. Obviously, however, they cannot catch fish which could not hatch and survive to enter the catch.

Fortunately, there are some species of fishes which can exist and even thrive in roily water, and these species (saugers, sheepshead, catfish, buffalo, and carp) are now constituting a large share of the total catch by Ohio fishermen in Lake Erie. However, these are second choice species and an increase in the abundance of the first choice species would be worth the expenditure of considerable effort.

At the Franz Theodore Stone Laboratory (a department of the Ohio State University, located on South Bass Island, 50 miles from the mouth of the Maumee River) regular analyses of the lake water have been made throughout the last few years. Farmers of the northwest section of Ohio would feel hurt if they could see how the nitrates from their fields are carried with the heavy spring run-off out to fertilize Lake Erie. The graph of nitrate abundance in Lake Erie is a record of farm losses which ought to be stopped. There is not yet one soil conservation district in this part of Ohio, but the losses are greater than those caused by the more spectacular gullies of the hill regions. The farmers somehow must be given an awareness of the problem and a concern for it, and help in applying methods of correction to their farmlands—such techniques as contour plowing, strip cropping, controlled grazing, and better ditching.

Ditches are essential to any land use because the land is so nearly level, but ditches can be made to carry more water by widening instead of deepening, and the banks can be given slopes of 3 or 4 to 1 and covered with turf to stop bankwash. The malpractice of burning ground-covering turf should be discouraged, to keep the cover as well as to avoid compacting the soil. Tightly packed soil—accelerated by burning—speeds the water away, while loose soil retains it for plant use later in the season when rainfall is scant.

The farm practice of permitting stock to graze to the water's edge, denuding creek and ditch banks of protective vegetative cover, is very common—and very disastrous. So, also, is the practice of giving barnyard stock direct access to the stream into which the barnyard drains as the principal means of supplying water to the stock. Stream banks are too frequently left unfenced and otherwise unprotected.

There is much to be done by Ohio farmers on pond and cistern construction to bring about greater convenience in the watering of livestock, to make better use of such water as is available, and to minimize the destruction of the soil resource. Likewise, there is a great deal to be accomplished in providing protection to creeks from the harm wrought by hog wallows and overgrazed banks.

(*Continued on p. 15*)

NEW ANGLE FOR SOLVING LEGUME SEED SHORTAGE

The disastrous shortage of legume and grass seeds this year has focused attention on an Ohio State University Experiment in bee pollination of clovers, which forecasts up to 1,500 percent increase in seed production.

With the national yield of red-clover seed at less than 1 bushel to the acre last year, the 12-bushel yields found possible with full pollination by honeybees should be attractive, say the departments of zoology, entomology, and agronomy of Ohio State University in a new bulletin. In the case of alsike clover, the yields went up from 1½ bushels to 20 bushels.

Most clovers are self-sterile, say the Ohio scientists, and are propagated almost entirely by insect life. What is not generally realized is the dominance of the honeybee. A 3-year study, just completed, shows that actual pollination of red clover was accomplished by honeybees in 82 percent of the cases, with bumblebees doing the work in 15 percent and other insects making up the remaining 3 percent.

The bulletin suggests that farmers everywhere take advantage of existing bee yards by growing clover crops in close proximity to them so as to "step up legume seed production" and be in line with the "save seed for victory" campaign. It is even suggested that "for purposes of heavy seed production, it may be desirable to increase the honeybee population to a degree where honey production becomes unprofitable," in order to provide the 100 percent pollination.

BLASTING FOR FOOD

Five hundred feet of drainage ditch at one blast! The sprinkler irrigation line in the foreground will be needed in the dry midsummer months when pastures wither even in this belt where 90-odd inches of rain falls annually.

By CARL P. STEVENS

Some sectors of western Washington's "farm front" have taken on a realistic military aspect the past year. Farmers in the important dairying sections of Grays Harbor County and nearby areas have been resorting to explosives to blast drainage ditches through hundreds of swampy acres and make them fit to grow pasture and hay crops.

Dynamiting this year started hundreds of additional gallons of milk flowing to the big Fort Lewis army base and other major West Coast war markets. By the turn of the 1944 spring growing season, not fewer than 15,000 feet of ditches had been blown neatly across previously useless or, at best, low-producing lowlands. They had brought some 1,200 acres into productive condition in the Montesano-Elma-Oakville Soil Conservation District alone.

Floyd Sherwood, head of the Sherwood Creek Drainage Association, organized to take advantage of assistance from the district and from the cooperating Soil Conservation Service, put it this way:

"This gives us a chance to increase our milking herd. We have had quite a time in the past getting enough pasture, and cows produce heavier on better pasture. The drainage doubles the land that can be tilled when we finish clearing, and it hasn't cost us as much as we expected. The way it has been, it was too wet even to clear. This last winter there has been no water on there at all; it found its way into the ditch."

Sherwood has 102 acres, 65 of which will bring him the extra feed he needs for the 45 cows and heifers he and son Amile take care of unassisted. His aim is to step up his actual milkers to 35 from the 25 to 30 that he milks now. He ships to Fort Lewis.

Others have had happy experiences with the new way of ditching—Albert Valentine, Ben Smith, Les and Fred Mouncer, Pete Hansen and James Dickinson. It was they who prevailed upon District Supervisor Chairman W. D. Olsan, Vice-chairman Clarence Glenn and Supervisor Harry Swenson to bring about the wizardy of dynamite drainage on lands that were too boggy for ordinary ditching machinery to tackle. It was they who noted past drainage accomplishments under more conventional methods.

They had heard P. L. Lavender say that the earlier Wenzell Slough drainage south of Elma had increased his pasture by nearly 100 animal months a season. They had heard C. O. Osgood state that on 75 acres of his woodland pasture, once totally unproductive, he is now getting 228 animal months pasture a season.

The farms of this one group alone total nearly 450 acres, of which 185 acres was totally unproductive because of lack of drainage. District engineers' surveys showed a need for a 6,000-foot main ditch and 4,000 feet of lateral and tile drains. The farmers lost no time in buying three tons of dynamite. After

EDITOR'S NOTE.—The author is District Engineer, Soil Conservation Service, Montesano, Wash.

two days' instruction by technicians, they went ahead with ditch blasting on their own. How well they did the job was borne out during the 1943–44 winter "flood" rains, when the then still uncompleted main ditch carried off all surplus water without any flooding of adjacent land.

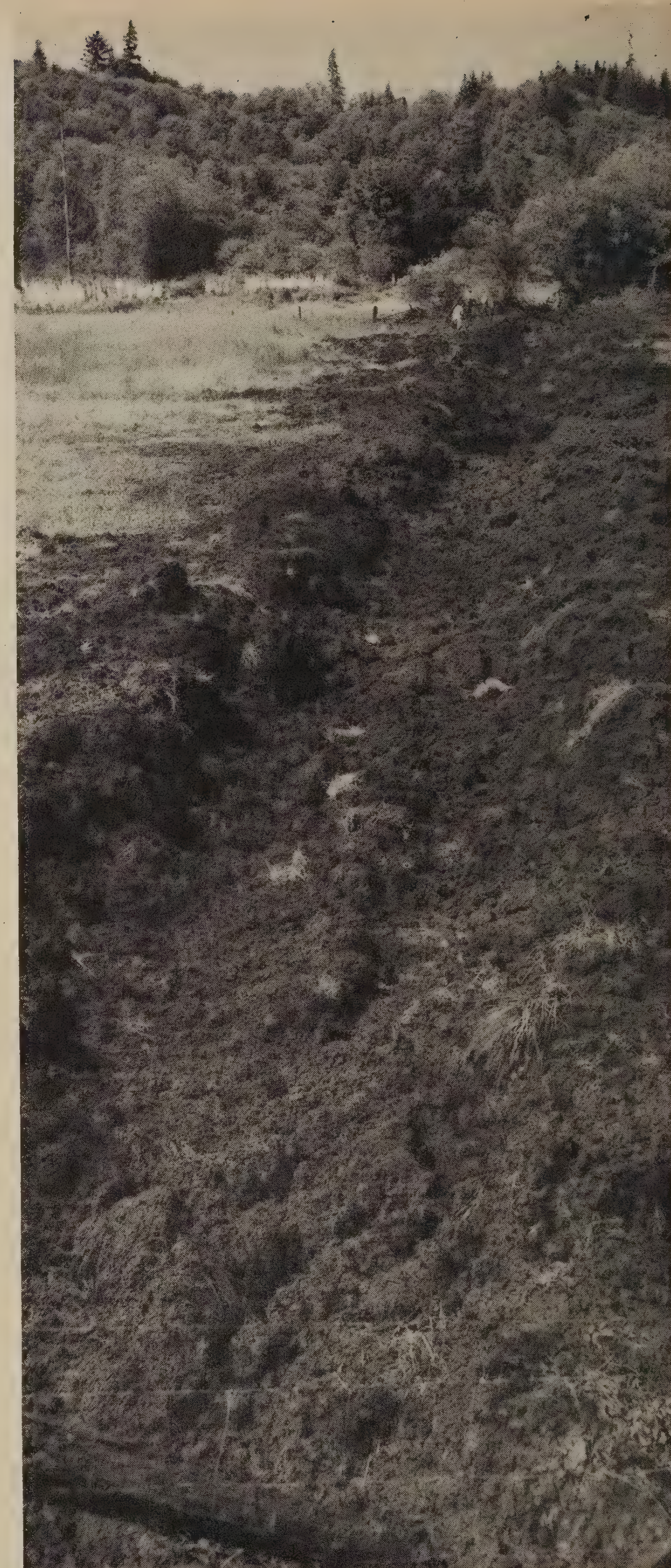
Or take the defunct Drainage District No. 2, also in Grays Harbor County. A 20-year-old drainage system virtually had ceased to function. The ditches had been allowed to clog with brush and weeds. Reorganized by a dozen farmers operating 567 acres, this drainage district similarly went to work with dynamite to do most of the cleaning job. As on Sherwood Creek, some ditching had been done by farmers with their own tractors and scrapers. Restoring 4,000 feet of the old ditch to working order means these war food producers are able to get into their fields weeks earlier and increase their yields proportionately.

One of the first dynamite ditching projects completed was on the 340-acre Marie Wolfisberg place near Elma, on which some 60 acres were too wet to farm profitably. The owner personally placed and tamped the special, 50 percent nitroglycerine blasting dynamite in the holes punched by Chris Studer and Fritz Wolfisberg for shooting the 2,400-foot main ditch, 4 feet deep, 6 feet wide at the bottom and 14 feet across the top. She figures on being able to farm six weeks earlier in the spring. The drainage affords 40 additional animal months of pasture.

These are representative of numerous low-cost individual and group ditching undertakings completed or under way in the Montesano-Elma-Oakville district. Though soil types and other conditions vary the dynamiting technique and the expense, the Sherwood Creek ditching, for example, showed an average powder cost of only 19 cents and labor outlay of only 10 cents a lineal foot. The cash cost of the Wolfisberg 2,400-foot ditch was exactly $307.22, or 9 cents a cubic yard, not counting the owner's own labor.

On the latter project, the three farmers were able to load and shoot as much as 500 feet of ditch in one 8-hour day. This ditching dynamite shoots by the propagation method in moist or wet soil, with the only equipment used comprising district-supplied "T" punch bars, a small electric detonator and 300 feet of blasting wires. *It enables shooting at safe distance with a single cap to set off a whole line of loads.*

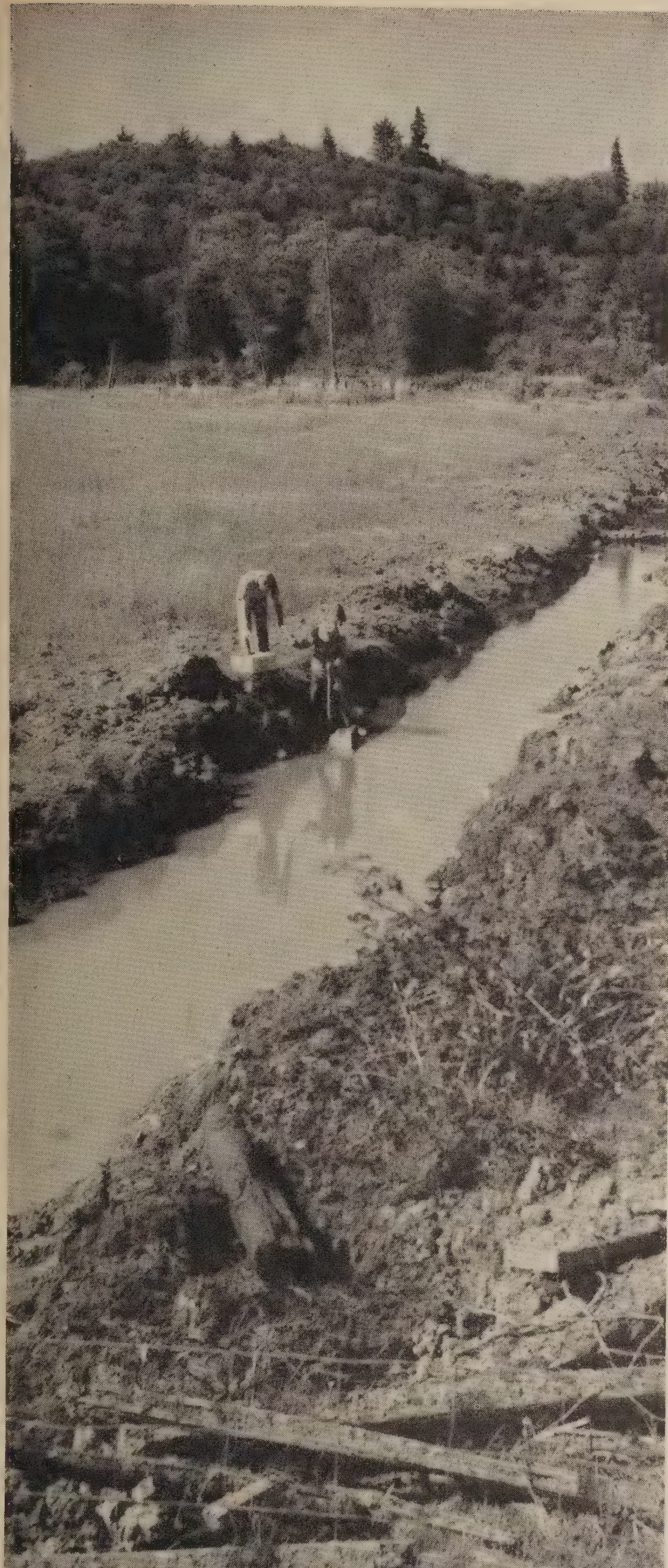
The farmers not infrequently have sizable audiences, interested at once in the spectacle of a line of wet, black soil skyrocketing 200 or 300 feet in the air



The newly blasted ditch before smoothing and finishing.

and in the practical possibilities of the ditching process.

Successful dynamite drainage, of course, is but a means to the all-important end of improved cropping



Unwanted water on its way.

and better production. This is accomplished through such further conservation practices as approved pasture seeding; harrowing and mowing, rotation grazing and the use of fertilizers.

SEDIMENTATION IN A GREAT HARBOR

(*Continued from p. 5*)

part of the cost of maintenance dredging in Baltimore harbor. It is estimated that the Patapsco River and tributaries currently carry more than 16,000,000 cubic feet of sediment into the harbor each year. If all of this were deposited in navigation channels, the average annual cost of removing it, at prevailing contract dredging prices, would be nearly $100,000 per year. The current Federal cost of maintenance dredging in Baltimore harbor is estimated by the U. S. Army Engineers to be $150,000 annually, but this probably includes overcoming past failures to "keep up" with the rate of silting as well as removal of sediment in the lower harbor which may come from the Susquehanna River.

Baltimore's sedimentation problem has not been confined to its harbor. For many years sediment seriously interfered with development of a dependable water supply. The city's first water supply reservoir, Lake Roland, was built on Jones Falls in 1862 with a capacity of 400 million gallons. Within 10 years the city was forced to begin sediment removal. By 1900 more than 434,000 cubic yards had been dredged from the lake at a cost of over $83,000. The reservoir was finally abandoned as a source of water supply in 1916.

In 1881 the city constructed a second reservoir—Loch Raven—on Gunpowder Falls at a cost of $321,000. The original storage capacity of 510 million gallons was reduced to 78 million gallons by 1900, despite the fact that 500,000 cubic yards had been dredged from it between 1896 and 1900. Dredging of the reservoir continued up to 1912 by which time an estimated 2,200,000 cubic yards, altogether was removed at a cost of $400,000. In 1912 a new and higher Loch Raven Dam was started. This dam was raised in 1922, and in 1933 another large reservoir was created upstream by the completion of Prettyboy Dam. These reservoirs are silting slowly only because their enormous storage capacity—a total of over 41 billion gallons—is developed in a relatively small watershed of 303 square miles. The rate of sediment production in the watershed is actually well above the average for the Southern Piedmont, a region of notorious soil erosion. Recent surveys of these two reservoirs show that a total of 9,600,000 cubic yards of sediment has been deposited in them since construction.

Equally severe sedimentation damages have caused partial or complete loss of value of other reservoirs in the Baltimore area, such as the 30-foot Illchester dam and the 30-foot Avalon water supply dam on the Patapsco River, the Woodlawn Cemetery Lake,

the Gwynn Oak Park Lake and many mill dams.

Soil erosion has been costly to farmers as well, for example, the 9,600,000 cubic yards of the sediment in Loch Raven and Prettyboy Reservoir is derived mostly from cultivated land which occupies about one-third of the drainage area above these dams. It, therefore, represents roughly the removal of 1 inch of surface soil from this land, exclusive of eroded material which has come to rest below slopes and in the valley bottoms. Studies by the Soil Conservation Service in the Corn Belt indicate that the removal of 1 inch of topsoil from a field will reduce corn yield by 5 bushels per acre. If the fertility of soil in the Gunpowder Falls watershed has decreased to a point where it would produce, on the average, only one bushel less per acre, then the loss in farm income, based on reduction of corn yields in 30 years, has cost the farmers in this watershed nearly a million dollars. The aggregate loss to farmers in the Patapsco watershed above Baltimore harbor has been even greater.

The city of Baltimore lately has been authorized by the State to incur an indebtedness of $50,000,000 for the development of the port. During the post-war period the United States will possess the greatest merchant marine in the history of this country, and probably in the history of the world. The future of Baltimore is auspicious. There is no doubt that the navigation channels of this port can be kept open by dredging to accommodate a vast post-war trade, but the wiser and most economical course would be to install complete soil conservation measures on the watershed. From experience and comparative cost data we know that it is easier and less costly to hold a cubic yard of soil on the land than it is to raise it from the bottom of a harbor, or a reservoir, and transport it, often many miles, to an isolated dumping ground where it can do no further damage.

Too little is known at present of the economics of soil erosion in relation to reservoir and harbor silting. In this connection research studies are needed to determine the nature, location and extent of erosion-control measures necessary in particular watersheds to achieve maximum reduction of harbor sedimentation with a minimum expenditure. Preliminary studies in the Patapsco River watershed indicate that approved conservation practices such as gully control, strip cropping, stream-bank protection, terracing, contour plowing, crop rotation and other measures, which can be fitted into the farm economy, would result in a substantial reduction of dredging costs in the harbor as well as very large benefits to the farmers and landowners. The sediment inflow to Baltimore harbor is conservatively estimated to be about 600,000 cubic yards annually. About 90 percent of this is derived from approximately one-third of the drainage area, mostly from the cultivated land. The total installation cost of erosion-control measures in the sediment source areas, plus maintenance for 25 years, is estimated to be about $750,000. With a well planned and carefully executed program, it is estimated that the sediment inflow from this area could be reduced by nearly 75 percent which, at prevailing contract dredging costs, would amount to a savings of $60,750 annually to the Federal Government alone. On the basis of benefits received solely from reduced dredging costs, this program, which should require no longer than five years to complete, would pay for itself in a little more than 12 years from date of completion. Over a period of 25 years, it would not only pay for itself, but would save the Government three-quarters of a million dollars besides. Add to this the many physical and economic benefits to be received by the farmers; by the owners of storage developments and by others, and the program would actually pay for itself, in value received, in but a few years.

KUDZU DONOR DE LUXE

A. J. Hilton, owner and publisher of the *Banks County Journal*, Homer, Ga., got the surprise of his life recently when one of his readers sent in a paid advertisement announcing that he had some kudzu crowns that he would give to anyone who would dig them. In a front-page story Mr. Hilton said:

"We've been fooling around with the advertising business several years, but never before last Monday did we receive a check to advertise something to give away. Bob Sanders knows what a great benefit kudzu will be to this country, and he wants to help the land and his fellowmen. His letter follows:

"'DEAR MR. HILTON: I have several thousand kudzu crowns that I want to offer free to any person in Banks County—all I ask them to do is to come and dig them.

"'Now if you will promise to dig them for any woman that's not able to dig them, I will help you take them up for her. Now, if this is not a bargain, what is a bargain?

"'I have been advertising for some 40 years and paying for the ads, but now I am willing to pay for an ad to give away kudzu crowns, as I believe kudzu is the best cover crop and hay crop we have in this country. I have lots of gullies that need filling up, and I am trying to get help to set out kudzu crowns on this land.

"'With kindest regards.

(Signed) "'BOB SANDERS.'"

This is the sales yard maintained by the marketing organization which the farm forester helped farmers organize. Farmers deliver their wood products here and receive their money on delivery.

CONSERVATION RIDES TIMBER TRAIL IN TURTLE MOUNTAINS

A wood splitter developed by members of the Turtle Mountain woodland association. One man and a helper can split about 1¼ cords of fuel wood per hour with this machine.

By WALTER H. PAUL and ELMER L. WORTHINGTON

Farmers in northern North Dakota's Turtle Mountains set up a forest products market three years ago. Their intent was to furnish an outlet for their timber. Actually, they provided as well the incentive for needed land use adjustments and other features of conservation farming.

The market succeeded and broadened. With woodland improvements made worthwhile, cattle had to be moved. Now, brush land is being cleared and other land, retired from cultivation, is being seeded to grass for needed new pastures. Development of stock water supplies, crop rotations, and tillage and cropping practices to prevent erosion followed naturally.

Notable also is the market's satisfying of both seller and consumer. Even before the present wartime market, the consumer, assured of a uniformly good product, doubled the price paid to the farmer and assured him of ready sales. The farmer, knowing that he can deliver his wood at his own convenience to the market at a uniform price, provided he maintains specified grades, finds his woodlands worth maintaining and improving.

This happy opportunity springs from the establishment by the Soil Conservation Service of a farm forestry project in 1940, followed in 1941 by the organization of the Turtle Mountains soil conservation district by the farmers. Soil Conservation personnel are now very busy helping to develop farm conservation plans.

Low-lying hills 400 to 600 feet high, the Turtle Mountains occupy a quarter of a million acres south of the Canadian border. Slopes are gently rolling to steep, some too steep for cultivation. Half of the area is woodland, of which 85 per cent is pure aspen, 12 per cent mixed hardwoods, 3 per cent bur oak. Adjacent is a large almost treeless plain which ships nearly all of its lumber and many of its posts from Oregon, Washington and Minnesota, and is a market for fuel wood to supplement the lignite coal mined there, lumber for farm buildings and rough construction generally, props and ties for the lignite mines, and fence posts. Most of the Turtle Mountain farms are classed as livestock-cash grain units. The average size is 294 acres, of which 163 acres is woodland.

Earlier, Turtle Mountain farmers depended on forest products sales for a substantial part of their

EDITOR'S NOTE.—The authors are the farm forester and district conservationist, Soil Conservation Service, Bottineau, N. Dak., respectively.

incomes. Marketing was unorganized, with no systematic effort to capitalize fully on the existing market or to develop its potentialities. Came the depression, and this manner of marketing floundered. There followed a long period when the farmers did little or nothing with their woodlands. There was no way to bring seller and buyer together. Often a farmer brought a load of wood when he came to town, only to haul it back unsold. It wasn't the right day. The market was further harmed by farmers too often supplying poor quality products. Returns did not justify expending much effort on the woodlands. Pasturing them heavily became the rule.

That was the situation when the Farm Forestry Project was initiated. The farm forester started some demonstrations first, then concentrated on cracking the market situation. With his help, the farmers in five townships organized the association which set up the present market. Each township elected two directors, from whom the officers were chosen. The directors selected an agent to buy and sell forest products on commission. The agent's commission was the association's sole operating expense, since he furnished the sales yard at Bottineau, the area's principal market place. The local cooperative creamery donated the use of a $1,000 revolving fund for operating capital.

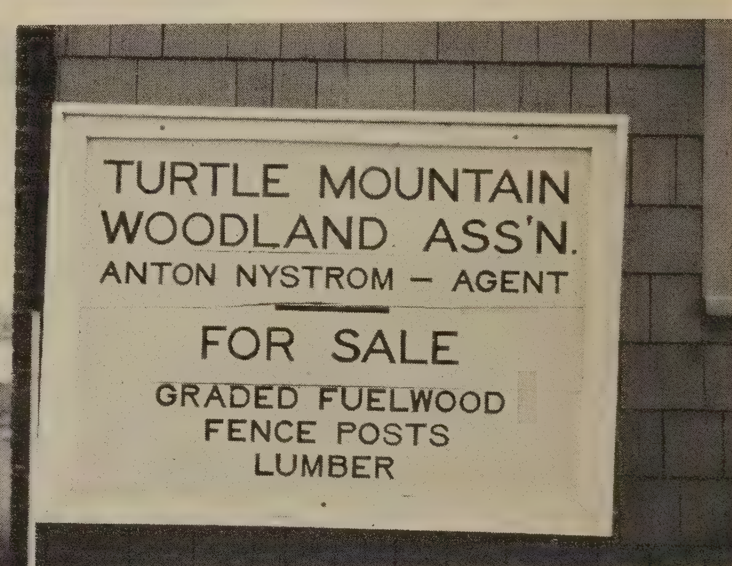
The sales yard buys fence posts and fuel wood on a graded basis from any farmer, paying approximately 80 percent of the price for which the agent expects to sell them. Any difference between purchase price, plus the agent's commission and the sale price is paid to the farmer at the end of the year on a patronage basis.

During the first year, 1942, the sales yard handled 19,000 fence posts and 300 cords of fuel wood, and last year 25,000 fence posts and 150 cords of fuel wood. Indications are that in 1944 business will exceed the total for the first two years.

Now, the association has a plant to treat aspen posts with creosote, using the hot-and-cold-bath method. An incising machine made from a trip-hammer is part of the plant, necessary because aspen posts case-harden. Last year, 3,500 posts were treated. The demand is so active that this year the association is buying 30,000 posts for treating. This has vastly improved the market for forest products from the Turtle Mountains, since aspen brings a better price as posts than sawed up for fuel. Treated, aspen posts last 15 to 20 years; untreated, 2 or 3 years. The treating mixture is 40 percent creosote, a by-product of lignite briqueting in North Dakota, and 60 percent fuel oil. Perforating the posts ½-inch deep on a 24-inch section, half above and half below the ground lines, gets satisfactory treatment.

General view of the Turtle Mountains in north-central North Dakota, where the farm forestry project helped farmers break a marketing bottleneck. This, in turn, has increased the interest in woodland management and also opened the way for a broader soil and water conservation program.

The post treating plant which has been established by the Turtle Mountain woodland association has broadened the farmers' market for wood products. Timber suitable for the purpose brings more when marketed as posts than as fuel wood.



The sign at the service station operated by Anton Nystrom, who handles the purchase and sale of wood products for the woodland association. Since Nystrom furnishes the sales yard, his commission is the only sales expense.

Farmers, too, are developing equipment. One piece is a wood-splitting machine made from the drive wheel of a steam engine and powered by a 1½-horse-power gasoline engine. With it, one man and a helper can split about 1¼ cords an hour.

The labor situation has impelled the association to shelve its other development plans, which include a good sawmill and emphasis on the production of local lumber. However, it was incorporated under the North Dakota laws last year to assure its own working capital. Shares are sold to woodland owners at $10 each. A working capital of $2,000 is required for the existing fuel and fence posts business, while $5,000 is estimated as needed to bring planned developments to reality.

Clearing of the brush-covered lands is going ahead rapidly, both the market association and soil conservation district helping in this, to compensate for the reduction of grazing in the woodlands. Clearing is done in winter when the ground is frozen, at a cost of a little more than $5 an acre. Pastures already developed in this way have greater grazing capacity than the woodlands they replace, thereby increasing food production for war.

Still another dividend has accrued to the Nation, in addition to getting needed land used adjustments, the development of formerly idle lands, and conservation farming in the Turtle Mountains. Now, when the railroads are heavily burdened in transporting men, arms and munitions, the increased use of these home-grown forest products lightens the transportation load by just that much.

REVIEWS

CONSERVATION IN THE UNITED STATES.

By A. F. Gustafson, C. H. Guise, W. J. Hamilton, Jr., and H. Ries. Cornell University. 1944

The authors have presented the basic principles of conservation so that the reader may understand both today's and tomorrow's problems in relation to the broad subject of conservation.

The first section deals with the soil and water resources of the United States. Special emphasis is given to ways of maintaining the productivity of the soil and of controlling loss of soil by wind and water erosion.

The second section tells of forest and associated range resources, together with public parks. It describes the Nation's existing resources, traces the steps by which forest and grazing lands have been depleted, shows the extent to which forest conservation has developed, and presents a constructive program for future action.

The third section deals with wildlife. Attention is called to the great economic value of the fisheries and to the far-reaching recreational significance of game animals. The abundance of wildlife in the past and some of the more significant factors responsible for its decline are reviewed. The authors point out very clearly that wildlife, the esthetic value of which is acknowledged, is a product of the land and should be made available for the enjoyment of everyone.

The fourth section deals with metals, minerals, foods, and nonmetallic minerals. The importance of mineral wealth is stressed and the extent of present nonreserves is shown. From the data which the authors present, it is apparent that supplies of many mineral products are not inexhaustible. Measures are suggested for the conservation of mineral resources.

The authors recognize soil conservation districts as being a distinct forward step in furthering the widespread adoption of recognized methods of soil erosion control and of rational long-term soil utilization. They point out a relationship between the private land owner and the public treasury. The term conservation, as used in the book, applies to the wise use of existing supplies of natural resources, the husbanding of those that remain for the benefit of future generations, the restoration and careful management of renewable resources and the establishment of a workable program that will make the soil serve the people perpetually and well. The authors divide the natural resources of the country into two broad classes—those which are renewable and those which are exhaustible. Those that are renewable are primarily of a biological nature. Soils are placed in the class of exhaustible resources; although their fertility may be restored, soil formation requires ages, and soil that is washed or blown away is gone forever.

The authors acknowledge that the natural wealth has been largely responsible for the building of the nation. However, they note that a new era is at hand, that the day of wasteful use is gone and cannot return. It is not without irony that a war may have been the only means of impressing the public with the importance of natural resources and the need for their conservation. Conservation is an economic and social problem. It is not primarily one of sentiment.

In the total conservation and water problem, the authors adhere to the principle that the utmost should be done to educate the farmer and the general public in the control of soil erosion and the conservation of water. If, after a reasonable period of education, the desired control is not attained, it may be necessary for a government agency to take steps toward this end. The authors state that such an agency should have authority and be entirely beyond political influence. The efforts of such an agency need to be directed toward complete conservation of soil and water so that ample food and clothing for the population may be produced, and flood damage and silting of reservoirs minimized.

—Grover F. Brown.

FISH AND FARMS SUFFER

(*Continued from p. 8*)

The community of interests involved is obvious, but a common concern that leads to united action has not yet evolved. The effort must be directed at the source of the trouble. It is essential that the top soil be kept on the farms throughout the northwest section of Ohio. This will make possible continued good farm production of essential food crops, will make better stream fishing for the sports fishermen, better hunting along the stream bottoms, and better food production in Lake Erie.

Do your part to reduce accidents!

NATIONAL FARM SAFETY WEEK

July 23–30

REFERENCE LIST ☆☆

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SOIL CONSERVATION SERVICE

Engineering Developments in Soil and Water Conservation. Paper prepared for Fall Meeting of American Society of Agricultural Engineers. Soil Conservation Service. mm.

Hydrologic Studies: Compilation of Rainfall and Runoff from Terraces C5, C6 and C7 and Watersheds C8 and W23 of the Central Piedmont Soil and Water Conservation Station, Statesville, N. C., 1933–1938. (Prepared for official use within the Soil Conservation Service. Not available for general distribution.) SCS–TP–52. Soil Conservation Service. March 1944. Processed.

Preliminary Report on Watershed Studies Near Waco and Garland, Texas. (Prepared for use by technicians of the Soil Conservation Service. Not for general distribution.) SCS–TP–53. Soil Conservation Service. April 1944. Processed.

Snow Surveys and Irrigation Water Forecasts for the Colorado River Drainage Basin, May 1, 1944. Division of Irrigation, Soil Conservation Service, Berkeley, California, with the cooperation of the Colorado Agricultural Experiment Station. May 1944. mm.

Snow Surveys and Irrigation Water Forecasts for the Missouri and Arkansas Drainage Basins, May 1, 1944. Division of Irrigation, Soil Conservation Service, Berkeley, California, with the cooperation of the Colorado Agricultural Experiment Station. May 1944. mm.

Snow Surveys and Irrigation Water Forecasts for the Rio Grande Drainage Basin, May 1, 1944. Division of Irrigation, Soil Conservation Service, Berkeley, California, with the cooperation of the Colorado Agricultural Experiment Station. May 1944. mm.

OFFICE OF INFORMATION U. S. DEPARTMENT OF AGRICULTURE

Can *You* Also Profit from Soil Conservation? AWI–98. Soil Conservation Service. April 1944.

Control of Flue-Cured Tobacco Root Disease by Crop Rotation. Farmers' Bulletin No. 1952. Bureau of Plant Industry, Soils, and Agricultural Engineering, Agricultural Research Administration. March 1944.

Fish for Food from Farm Ponds. Farmers' Bulletin No. 1938. Soil Conservation Service. Revised April 1944.

Guides for Cutting Timber in the Northeast. AWI–90. Forest Service. April 1944.

Investigations in Erosion Control and the Reclamation of Eroded Land at the Palouse Conservation Experiment Station, Pullman, Wash., 1931–42. Technical Bulletin No. 860. Soil Conservation Service, with the cooperation of the Washington Agricultural Experiment Station. April 1944.

Prevent Accidents. AWI–87. U. S. Department of Agriculture. February 1944.

Soil Conservation Aids Soybean Production. AWI–92. Soil Conservation Service. April 1944.

Some Plain Facts About The Forests. Miscellaneous Publication No. 543. Forest Service. April 1944. 10¢.[1]

Twenty-Third Annual Report of the Southern Forest Experiment Station, New Orleans, Louisiana, 1943. Forest Service. mm.

Workers in Subjects Pertaining to Agriculture in Land-Grant Colleges and Experiment Stations, 1943–44. Miscellaneous Publication No. 535. Office of Experiment Stations, Agricultural Research Administration. April 1944. 25¢.[1]

Your Country's Armed Services Need Milkweed Floss. AWI–94. Prepared by the Soil Conservation Service for War Hemp Industries, Inc., agents for Commodity Credit Corporation, United States Department of Agriculture. April 1944.

STATE BULLETINS

Alfalfa and Smooth Bromegrass for Pasture and Hay. Circular Bulletin No. 189. Agricultural Experiment Station, Michigan State College, East Lansing, Mich. April 1944.

Condition and Market More Cattle While the Nation is at War. Bulletin No. 169. Agricultural Experiment Station, University of Nevada, Reno, Nev. May 1944.

Farm Outlook and Economic Problems for 1944. Circular No. 181. Extension Service, North Dakota Agricultural College, Fargo, N. Dak. February 1944.

Fertilizers for Legumes. Special Bulletin No. 328. Agricultural Experiment Station, Michigan State College, East Lansing, Mich. April 1944.

Fertilizers: What They Are and How to Use Them. Special Bulletin No. 133 (Revised). Agricultural Experiment Station, Michigan State College, East Lansing, Mich. March 1944.

Fish Production in Farm Ponds. Circular No. C–115. Agricultural Experiment Station, Oklahoma A. & M. College, Stillwater, Okla. April 1944.

Irrigation–Water Requirements of Citrus in the South Coastal Basin of California. Bulletin No. 686. Agricultural Experiment Station, University of California, Berkeley, Calif. March 1944.

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[1] From Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.

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AUGUST 1944

SOIL CONSERVATION

OFFICIAL ORGAN OF THE SOIL CONSERVATION SERVICE

TED STATES DEPARTMENT OF AGRICULTURE, WASHINGTON, D. C.

SOIL CONSERVATION

CLAUDE R. WICKARD · MARVIN JONES · HUGH H. BENNETT
SECRETARY OF AGRICULTURE · WAR FOOD ADMINISTRATOR · CHIEF, SOIL CONSERVATION SERVICE

ISSUED MONTHLY BY SOIL CONSERVATION SERVICE, U. S. DEPT. OF AGRICULTURE, WASHINGTON, D. C.

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WELLINGTON BRINK EDITOR

CONTENTS

Front Cover: A little nostalgic, reminiscent of an era that is rapidly passing with the coming of header and combine. Photographer unidentified.

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SOIL CONSERVATION: No. 1 POSTWAR JOB

By THE HONORABLE CLAUDE R. WICKARD
Secretary of Agriculture

The Secretary of Agriculture, who brings an important message to America.

As Secretary of Agriculture, I have occasion to speak on a great variety of subjects, but there is no subject I can discuss with more enthusiasm than soil conservation.

The conservation of soil and water resources is one of the imperative jobs of America. There is no political, economic, social, or scientific disagreement about this fact. Fertile soil is a matter of national concern, and everyone interested in agriculture wants to see that soil protected and improved. It is part of the physical foundation of our country and no one wants to see it washed away.

Nevertheless, it has been washing away—in great quantities, from great areas, and at great speed. No other nation has lost so much soil in so little time. Ever since the first settlers landed on our shores, we have been plowing the soil and exposing it to the wind and rain. Each year, as more and more land was opened up, we lost more land, and at a faster rate, each year. When this continent was first being settled it was covered, as an average, with about nine inches of productive topsoil. Today the average depth of our topsoil across the country is only about six inches. That is the average. In too many places, the topsoil is gone all together. Only raw clay, or sand, or gravel is left. And in too many places, gullies have cut the land to shreds. It's mighty hard to get food out of gullies.

Let me tell you in other terms what erosion has done to us. It has ruined for any further cultivation some 50 million acres of cropland. That is an area equal to all the land in Maine and New York, and equal to, at least, one-eighth of our total present cropland. Before erosion wrecked it, this was some of the finest land in the country. Today it is producing no food for the war and tomorrow it will produce no food for the peace.

That is not all. Erosion has almost ruined another 50 million acres of cropland. Just about all the topsoil is gone from this land and it is riddled by gullies, but here and there a few people are still trying to farm some of this bankrupt land. I need hardly tell you they are attempting the impossible. Gullied land with little or no topsoil will not support an American standard of living.

Still another 100 million acres of cropland have lost more than half of their productive topsoil. And on yet another 100 million acres of cropland, the erosion process is under way. In short, erosion has already damaged more than two-fifths of all the cropland of the United States. The surveys show that additional hundreds of millions of acres of range and pasture land have also been hurt.

EDITOR'S NOTE.—By special permission SOIL CONSERVATION is privileged to publish the remarks made by the Secretary of Agriculture before the recent Rotary District Conference in Reading, Pa.

What I am thinking about is a major threat to the prosperity and to the very life of the country. Some people regard it as our No. 1 peacetime enemy, second only to our wartime enemies—the Axis nations. It is a cancer in our agriculture and a drain on our pocketbooks. Each year erosion costs the United States in the neighborhood of $3,844,000,000 in wasted soil, railroad and highway damage, flood damage, abandonment of farms, reduced reservoir capacity, and other losses. And where erosion is permitted, the standard of living soon goes down. Around the world, since the beginning of history, poverty has followed in the wake of erosion.

No, erosion is not new and it is not a devil confined to the United States. There is scarcely a nation on earth without its erosion problem, and some face a tougher job than we do. Here in this country nothing really effective to halt the inroads of erosion was done until 10 years ago, when the blowing soil from the Great Plains began blotting out the sun at midday over state after state. It was only then that any great number of people recognized the urgency and the emergency proportions of the soil erosion problem in our country.

To be sure, there had been terracing programs in the South, and from time to time, in different states, there had been stress on crop rotations, and cover crops, and fertilizers, and diversion ditches, and on a few other single practices. But no attempt had been made to put these several single measures together to do a complete job of erosion control, according to the needs and capabilities of the land itself. As a matter of fact, in most places it was mighty hard to find any interest in erosion at all. No interest in erosion, mind you, at a time when some two-fifths of the cropland of the country was being damaged and 50 million acres of our best cropland had already been washed away! Some agricultural leaders were even reluctant to admit that erosion took place in their states.

Then Congress established the Soil Conservation Service to carry on a nationwide action program against erosion, which was truly described as a national menace. By that action an effort was made to do something positive about a problem which had been seriously and tragically neglected until that time. Thus for the first time in history, a program was developed which protects the land against wind and water even while the land is being used for crop production.

Through the work of the Soil Conservation Service, nearly 10 percent of the farmland of the country has already been protected against erosion. By all reasonable reckoning, this is permanent and complete protection. I have heard of no farmer who ever seriously tried soil conservation and then gave it up.

Farmers approve of this program. It makes good sense, for conservation farming has demonstrated that it not only protects the soil but increases yields per acre at the same time. On thousands of farms in all parts of our country, conservation farming has resulted in an average 20 percent increase in production per acre. That's a worthwhile increase any time, but especially in war time. And this is accomplished with little or no additional equipment, time or labor. As a matter of fact, many farmers say that conservation farming is easier and that it takes less fuel and less time than the old-fashioned methods.

What is conservation farming? Dr. Hugh Bennett of the Soil Conservation Service has defined it as "common sense farming with scientific methods." It means treating every acre of land according to its individual needs, and using every acre according to its individual capabilities. Each acre of land, like each human being, is different from the next one. To get the best from it, it must be handled in just the right way. If there were some simple remedy for the problems of the land, that could be applied everywhere in a standardized treatment or formula, the job of soil conservation would be relatively easy. But there is as much variety in erosion as there is in the landscape.

There are some 59 major soil conservation practices now being used to stop erosion, conserve rainfall, and improve the land. These practices include terracing, contouring, strip cropping, grassed waterways, and so on. Each one is used to meet a given need or to provide a desired result.

The trained soil conservation technician prescribes for the land just as a physician prescribes for his patients. In a sense, soil conservationists are "land doctors." These men have learned that half-way measures will not do the job. Each conservation measure applied to the land is designed to support another one, and the conservation work on one farm is carried out with an eye to the next farm—and to all the farms farther downstream. This viewpoint is essential, for erosion has no respect for boundary lines. Gullies do not stop at fence lines or even for county lines, and neither do dust storms.

All this means that modern soil conservation demands the utmost in technical excellence to succeed. And all of us may well be proud that today the United States is leading the world in soil conservation. Farmers, scientists, and agricultural leaders of other nations come here to study what we have done, because it is the first time anything so effective has ever been done. Other countries are following our lead. They are adopting our methods—our technology and our approach to the erosion problem. More than one country has established a Soil Conservation Service, modeled after our own.

The services of our soil conservationists are being requested by the governments of our allies and whenever we can spare one of these men, we "lend" him, in a manner of speaking, for a short time. I regard this as right and as a tangible part of our Good Neighbor policy. Moreover, I believe it altogether proper that the achievements in soil conservation, which were pioneered and developed here, should be made available to all.

Now despite the amazing progress which we have made in the last 10 years, erosion of our irreplaceable soil resources is still a national menace. Erosion is still proceeding at a rate faster than our constructive work to stop it. Yet there still remain a few people who say that action is not necessary. Let us return, they say, to the educational processes. Actually what they are saying is that we should return to the do-nothing policy of the past which was responsible for the very predicament we are in today.

I have no quarrel with the educational processes. They must be utilized to the fullest possible extent. There is more need for education in soil erosion and soil conservation today than ever before. But we are not faced with alternatives. We are not forced to take either education or action. We need both —more of both. Education and action in soil conservation must proceed hand in hand. It is the only way we shall halt erosion in time.

I also hear some folks remark that when a piece of land belongs to a farmer he has a right to do with it whatever he wants. That attitude on the part of many sincere people reflects the love for action without restraint which has always characterized the American people—plus what, until recently, appeared to be our limitless natural resources.

In other words, so long as there was always new land to be had for the taking, it was no concern to a man's neighbors, or his children or the rest of society if this man farmed his land out in a few years. He moved on, or his children moved on, to new territory and started the process all over again.

Likewise, in those days, the problem of law enforcement was pretty much a matter of individual concern. Each looked out for himself and his own, while justice and social responsibility figured more or less incidentally, if at all, in life's simpler pattern.

But times have changed, as we all know, and I prefer to believe that we are all stewards of our natural resources. Ownership of land does not carry with it the right to destroy land; it does carry with it the responsibility to protect and improve land. Every farmer holds his soil in trust for generations yet to come.

The question is often asked why farmers need help to conserve their soil when soil conservation is such an obviously good thing that the average farmer ought to do it himself in his own best interests. The answer is that the average farmer is no more prepared to solve all his own erosion problems alone than he is prepared to solve all his own legal or medical problems alone. He needs specialized, scientific assistance, and the government is making that assistance available because the

nation also has an interest and a responsibility in the protection of soil resources.

For example, to handle excess water safely, on sloping land, it is usually necessary to build terraces or ditches. The terraces need to have protected outlets, or the water will begin to cut into the soil. And even after you have moved the water safely off the field, you need a place to put it. For the farmer to solve such problems of water disposal all alone, he would need to have some degree of proficiency in engineering. But most farmers do not have this specialized type of training. Most farmers are not engineers, or hydrologists, or agronomists or foresters. They are farmers, and when it comes to a matter of dealing with an erosion problem on their land, they usually require the help and advice of a trained soil conservationist if they are to arrive at the correct solution.

I want to tell you how this technical service is made available to farmers, and to do that I must tell you a little bit about soil conservation districts.

Soil conservation districts are subdivisions of the states. They can be formed only in those states which have passed laws authorizing farmers to form them. They can be formed only in the manner prescribed by these laws. Farmers wanting to organize a district must submit a petition to the state soil conservation committee. The committee then holds a public hearing on the question in the area proposed for district organization. If the public hearings show a favorable sentiment, the question is then put to a vote of the land owners and land operators in that area. In other words, the farmers themselves decide whether or not there is to be a district for soil conservation.

A few individuals from a bygone era, who are more concerned with personal power than with progress, raise a shrill cry once in a while that these districts are arms of federal government and "regiment" farmers. I find it hard to call this process "regimentation."

If the farmers vote favorably on the establishment of a soil conseravtion district, it becomes a legal subdivision of the state. However, it does not have the authority to tax or to issue bonds. In most states, the laws provide that district affairs shall be directed by a board of district supervisors, composed of five members. Three of these members are elected by popular vote within the district and two members are appointed by the state soil conservation committee. Where is the "federal regimentation" here?

The supervisors go to work with the farmers to develop a soil conservation program for the district. They decide for themselves what they want to do, when they want to do it, and how they want to do it. And because they are working together, in full cooperation with one another, they are able to carry on a constructive program that will get things done.

Now here is where the technical service of the Soil Conservation Service comes in. It happens very often that the supervisors and farmers of a district decide they want some technical assistance in carrying out their program. In that case they may ask the Department of Agriculture for it, and if a technician is available, he can be assigned to work in the district. In the same way, a district may request—and receive—assistance in forestry problems from forestry agencies, in educational problems from the Extension Service, in roadside problems from the highway department, and so on. Farmers working together on a common problem are able to get more help and get more done than when they work independently and alone. That has been true ever since the days of the Pilgrim Fathers and district organization is in the best tradition of America. In this country, men and women have always banded together, in a free and voluntary manner, to accomplish worthy objectives and the wishes of the majority. This is the very spirit of democracy.

Today, 45 states have soil conservation district laws. Under the provisions of these laws, farmers have organized—by their own votes —more than 1,000 soil conservation districts. More than 2,500,000 farms or ranches, covering more than $500,000,000 acres, are now within district boundaries. Farmers have made a magnificent start on this prodigious problem. This is the best kind of evidence, I think that farmers recognize the urgency of

controlling erosion. Farmers know, better than anyone else, that soil conservation work cannot be done on the land unless somebody goes out and does it. They know, too, that educational processes and meetings alone will not plug any gullies. They remember that educational processes and meetings alone never plugged any gullies in the past.

Soil conservation technicians are helping farmers solve their erosion problems out in the fields and pastures where the erosion occurs. That is where it counts; where actual results can be obtained.

New and better ways of controlling erosion which may be developed in Iowa are promptly made available to technicians working with soil conservation districts in Pennsylvania and in other states. When a better method is discovered in Pennsylvania, it is made available right away to the technicians in every other part of the country.

The same is true of discoveries and developments at the soil conservation experiment stations, which are conducted cooperatively by the state agricultural experiment stations and the Department of Agriculture. Department conservation nurseries test new and promising grasses and plants for erosion control. Heavy machinery and equipment, which may be essential for two weeks or two months in a soil conservation district, are made available by the Service and then moved on to the next district in some other part of the state or in the next state. Technicians are moved, too, from one district to another, as needs develop or dwindle.

In these and many other ways, we in the United States are carrying forward a highly efficient, nation-wide program of soil conservation. The same high technical standards of work prevail in all states throughout the country and the so-called overhead costs are kept to a minimum. Add to this work the conservation achievements of other National agencies, such as the Agricultural Adjustment Agency and the Forest Service, and the total conservation effort is all the more significant.

How different it would be if we had 48 independent soil conservation services, each with different technical standards, and each attempting to maintain its own corps of technicians, experiment stations, nurseries, stocks of heavy machinery and equipment, and its own administrative organization for this work. Think how the costs would go up and the technical standards would begin to waver. Perhaps for financial or political or other reasons some states might even abandon the program.

The United States is a great nation because it was richly endowed with natural resources and because Americans are people of great ingenuity. I believe we shall always have our ingenuity, but we *can* lose our natural resources. We can conserve these resources, if everyone will take an interest and do his part. In this job there is plenty of room for all to serve.

For many months, I have been urging that we in America emphasize those undertakings, which will at once contribute most toward the winning of the war and, at the same time, help us forward toward our great peacetime objectives. Soil conservation is such an undertaking. Today it is giving us greater production of food and fiber for war, and at the same time it is protecting and improving the land for all the years to come. Some day our victorious men will be coming home, and we shall turn to the business of building a better life and a better country than we have had before. When that day comes, you will find that conservation of our soil is still high on the list of the great unfinished jobs of America. Remember that it is a big job and a necessary job—as big and necessary as America itself.

War-time values of farm and ranch ponds for fish production is well shown by the fact that in the Coleman work-unit of the Central Colorado, Texas, soil conservation district 200 ponds will be stocked with bass and bream this summer alone.

Lespedeza bicolor, favorite plant for field borders, is a favorite for bobwhite quail also. In 38 out of 40 plantings of bicolor on the State Game Refuge at Belmount, South Carolina, bobwhites this year moved in and wintered.

SEEING IS BELIEVING

First, make a contour map, instructs Mr. Summers. Exaggeration of slope is necessary for a good demonstration. Trace each contour line on a separate piece of half-inch cornstalk board. Cut with a keyhole saw.

By WILLIAM H. LATHROP

George E. Summers, Van Buren county, Iowa, soil conservation district technician, no longer worries whether his farmer-listeners are "on the beam" when he talks about contouring.

In Summers' meetings, farmers now say "I see what you're talking about." And they do.

With 50 cents worth of cornstalk board and some lumber scraps, Summers built a take-apart model of a hillslope which has saved him 10,000 words per farmer in explaining countour lines, where they should be placed and how to handle point rows.

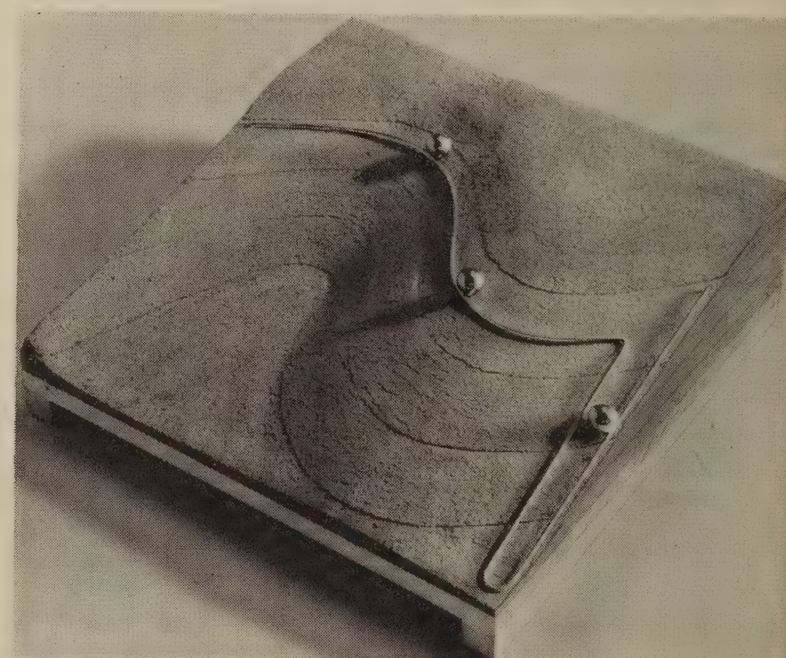
On the model slope, he lays out contour lines with pins, using a "T" pin to represent a level. By removing the slice of the model in which the pins have been placed he demonstrates quickly that the contour line is level.

To explain strip cropping, alternate slices are chalked different colors.

In demonstrating terraces and diversion dikes, Summers lays a coarse string across the slope of the model. A wire terrace and outlet can be bent to shape and steel balls rolled along it. The slow

Editor's Note.—The author is head, regional visual information section, division of information and education, Soil Conservation Service, Milwaukee, Wis.

Second, three-inch dowell pins are fitted in the wooden base to hold the slices together. Shape slices with rasp. Finish with sandpaper.



Third, on one of the models Summers attaches a wire to represent a terrace and an outlet.

Fourth, we see Summers demonstrating the device. Here he employs a model representing a typical slope in his territory to explain point rows to Clarence Strait and John Workman, Van Buren county farmers.

speed is contrasted with that of a ball allowed to roll straight down the slope.

Summers says he has found that the take-apart model is much simpler to build than the usual plaster of Paris model and in addition is more effective for demonstration purposes. His foot-square model, base and all, weighs less than 4 pounds.

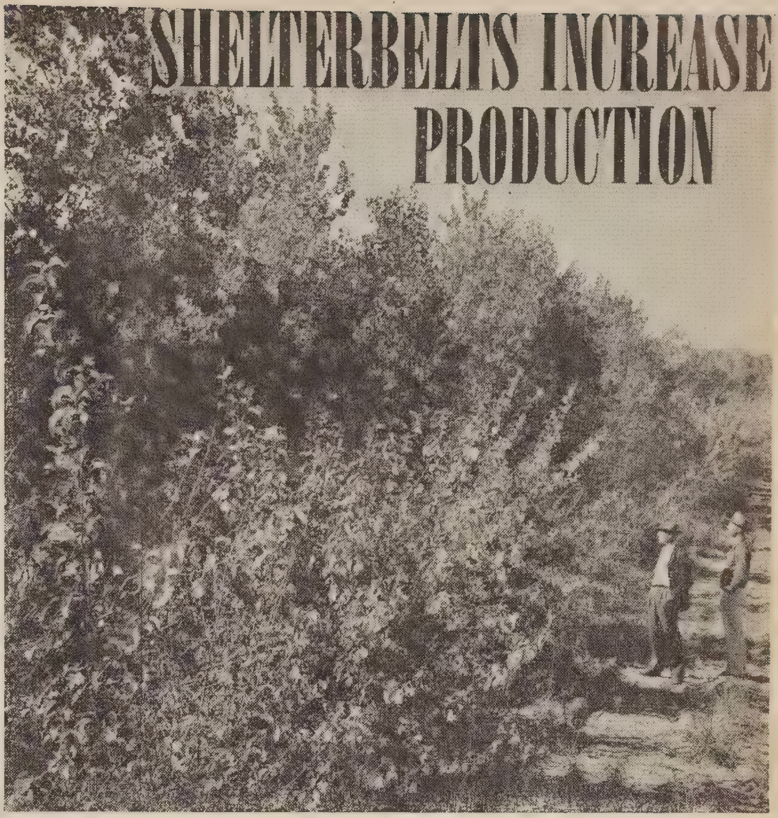
FARMERS FLOCK TO DISTRICT REFERENDUM

An intensive educational program, including all the ordinary methods and some not so ordinary, resulted in 74.3 percent of the eligible voters in Switzerland County, Ind., participating in the soil conservation district referendum March 24. Of the 1,879 eligible voters, 1,357 voted for and 52 against the district.

The problem was not only to acquaint people with the district but to get them to vote, because the Indiana law requires that 60 percent of the eligible voters cast ballots and 60 percent of those voting be in favor of the district.

Roy E. Babb, Madison, district conservationist, outlines the methods used by the local sponsoring committee as follows:

1. The county agent and home demonstration agent discussed districts in every group meeting in the county.
2. Sponsoring committee and "action committees" were carefully selected, their principal functions being to stir up interest, explain the district, carry petitions, and stimulate voting.
3. Vevay Kiwanis Club adopted the district as one of its major projects. Merchants made it a point to remind rural customers to vote.
4. Free advertising in theatres, news stories, and party line telephone calls donated by the telephone company helped to keep the subject before the public. Two local banks paid for neswpaper advertisements urging farmers to vote.
5. Local farm organization leaders gave active support.
6. Cards explaining the district and the referendum were sent to every landowner.
7. Receipt of absentee ballots was checked every three days, and each committeeman was notified so he could know the situation in his township.
8. The organizing committee met 12 days prior to the referendum and checked on the number of absentee votes and on the interest that had been shown. It then assigned more committeemen to sections where interest was lagging.



R. J. Tucker gives a large measure of credit to shelterbelt plantings for the production of more than one-half bale of cotton an acre last year on his deep sandy land farm northeast of Paducah, Tex.

"I would rather have 100 acres behind shelterbelts than 150 acres outside them. Before the shelterbelts were planted, I had lots of trouble getting uniform stands of cotton and other crops because early spring winds blew out the young plants. Of course, the kind of yield you get depends a whole lot on taking care of your land, but the shelterbelt helps."

Until the shelterbelt was planted, Tucker said all trees except plums had been winter-killed when he attempted to grow an orchard. He now has 427 plum trees, 50 pear trees, and 50 apple trees safely growing under the protection of shelterbelts on the north and west sides of his orchard.

The accompanying picture convincingly tells how a good farm shelterbelt appeared last October after a dry summer. It was made on the W. W. Heckathorn farm near Childress, Texas, in the Hall-Childress soil conservation district.

Similiar methods in Clark County, Indiana, resulted in ballots on March 10 from 75 percent, or 2,035, of the 2,711 eligible voters. Votes in favor totalled 1,937. The method of approach and certain details varied because of the presence in Clark County of a larger city and several defense plants, as contrasted to Switzerland County's purely agricultural area.

Conservation in Cleveland

This, too, is "school!" A great city, no less than a farm, has its serious erosion problems. One of them here gets the attention of schoolgirls Ruth Roorecht and Lois Ritter.

The erosion hazard strikes at cities, too. Teachers, civic leaders and the press are beginning to worry about the menace of debris-burdened streets to the major crop of every crowded town. Raw slopes, they know, endanger boys and girls no less than corn and potatoes.

Little more than a year ago thirty blocks in Cleveland, Ohio, constituted a disreputable catchall for rubbish, sludge, garbage, tin cans, and roving rocks. Today, the Walworth Run-Train Avenue artery is on the mend. Cooperative enterprise and an awakened community conscience are effecting slow but certain transformation. Rats, ants and cockroaches are moving out. Grass, trees and shrubs are moving in.

Children themselves took the initiative. They were just a little bit ahead of everyone else in discerning the street's sins in terms of washing slopes. Children digging in the dirty sand along the way brought the comment of another child, "That's the way these big ditches start!"—and thereby planted a thought that grew, and grew, and grew.

For several years Margaret Suhr Reed had been drumming for conservation in the Cleveland Plain Dealer. On Arbor Day, and again on Armistice Day, tree-planting on a large scale had been encouraged. Here, along these thirty blocks paralleling a railroad track, was another challenge to city conservationists. Mrs. Reed suggested the merits of the Walworth Run-Train Avenue project in her column.

Grade-school children spread the word, churned up neighborhood interest. A large community

meeting, called to consider the situation, brought together the mayor and several councilmen, members of the city health, landscape and planning departments; representatives of the railroad and bordering manufacturing plants, spokesmen from the West Side Garden Center, forward looking private citizens. The celebrated Peter Witt spoke feelingly of the departed beauties of the area, recalled the pristine period, not so many years ago, when springs ran clear and deer roamed the woods. The meeting decided on direct, immediate, cooperative action.

A thousand pupils of Walton, Mill and Clark schools pooled their efforts. A committee called on manufacturing plants and other business houses to stop dumping slag down the slope toward the highway. Children went from house to house, asking families to find other, and better, means of garbage disposal. Maps and diagrams, reflective of the spirit and theme of soil conservation everywhere, began to paper the walls of classrooms. One of them was titled, "Ditches become gullies that speed erosion." Another bore the caption, "Footpaths on Train Avenue start erosion." A third posed the question, "What will you choose?" and offered a choice between ugliness and beauty, disease and health, waste and conservation, filth and cleanliness, erosion and plants, a civic eyesore and a beauty spot. One young artist graphically portrayed a foundry's slag sliding down a slope. Another pictured some of the street's vermin.

Three young Clevelanders getting acquainted with the soil: Helen Hartman, Robert Speir, and Rose Marie Balince.

In the fall of 1943, using suggestions supplied by the landscape department, the school children set out some 300 trees. In the spring of '44 Lincoln High joined the movement in time to help plant large numbers of shrubs and matrimony vines and other ground-covering vegetation. In little more than one year the street has begun to gain an aspect of respectability.

The task is well begun, but the school kids and their elders are determined to see it through. This summer they are spending many vacation hours policing the street, quick to pounce upon violations of the conservation code they have invoked. They know where to turn for help and encouragement: James Lister, of the landscape department, Henry W. Speeth, of the city council; Mayor Frank J. Lausche, Mrs. Reed, the Cuyahoga County Conservation Council, Nola Rearick, art teacher at Lincoln High School, others of a rapidly growing group of conservation-minded citizens. Bank protection of streets has joined the Victory garden in the great metropolis of northern Ohio, to impress upon lawyer and mechanic, office worker and industrial employee, parent and child, the importance of soil conservation.—WELLINGTON BRINK.

RAMSER AWARDED JOHN DEERE MEDAL

C. E. Ramser is announced as the 1944 recipient of the John Deere Medal awarded by the American Society of Agricultural Engineers. The award "confesses the debt of agriculture, and of industry which serves it, to both pure and applied research by men in public service. It honors a man who probably has found out and made known for service to mankind the world's greatest fund of facts about the habits of flowing water as it affects the soil and the permanency of the world's food resources."

In charge of hydrologic investigations of the Soil Conservation Service, Mr. Ramser directs experimental work in the hydraulic laboratories of Spartanburg, S. C.; Minneapolis, Minn.; and Stillwater, Okla., and is responsible for hydrologic studies being made at some 40 points in the United States.

Today we can report that considerable strides have been made toward the accomplishment of a practical program of wildlife management as a result of soil and moisture conservation measures applied by farm and ranch operators.

SOIL CONSERVATION—ITS RELATIONSHIP TO WILDLIFE AND HUMAN WELFARE

The attractive young lady at the right is this year's winner of the Asa B. Wallace Memorial Essay Contest. And the bit of prose which carried Gladys Kunze to fame and glory in her beloved State of Missouri is to be found just below the garden soil which so engrosses the attention of the sunbonneted pupil of Whitehall School, Fayette. Until better prose comes along, it will do very nicely as a model for much older soil conservationists.

Cash prizes are awarded to district and State winners in the annual essay contests sponsored by the Missouri Conservation Commission, contestants being boys and girls participating in the Missouri Nature Knights Program.

Gladys Kunze, State winner.

By GLADYS KUNZE

The greatest natural resource of our nation is its soil. It is the direct source of all plant food and the indirect source of all animal life. The wheat that makes our loaves of bread, the corn that feeds our cattle, hogs, and sheep, the cotton that clothes our school children, the trees that provide our shelter—all these and more come directly from the soil. The farmers of America are all set to make "food fight for freedom". It's up to them to grow more food for our fighting men, our working men and our allies. The welfare of the human race depends on these people doing their job. The soil is truly the arsenal of freedom.

Allied with man in producing both food and clothing is the wildlife of our country. The birds that follow the farmer's plow, picking grubs and insect larvae from the newly turned furrows, are battling with him against the enemies which damage his crops. The songbirds and game birds wage a constant war against other insect enemies. Even the small furbearing mamals have gone to war by providing furs for our flyer's suits. The most important influence upon this wildlife is the land on which it lives. Two of the necessities of existence, food and cover, are furnished by the soil.

The soil of the United States is in danger due to unwise farm practices. When trees are cut down, slopes plowed up and down, and vegetation burned the soil is left without protection. Water flowing over the surface removes thin sheets of topsoil. On slopes gullies may be made. On prairie lands wind erosion occurs. With a depleted soil both man and wildlife must suffer.

There is a complete interdependence of all fields of conservation. The conservation of the soil is directly related to the conservation of wildlife. Every farming practice, in its own way, makes a farm a better or worse home for wildlife. It determines the number of songbirds, gamebirds, and fur animals that may share his land. There are fewer wild animals in Missouri in our generation because there is less land suitable for them. There is land which cannot or should not be used for farm crops such as steep slopes, gullies and draws, fence rows and corners. The planting of trees, shrubs, and grasses on such land would not only protect the soil against erosion but would provide food and cover for wildlife.

One of the crops which may be planted to build the soil, smother weeds, check erosion, and furnish forage is sweetclover. It furnishes some food to a number of birds, and makes good cover for game birds such as pheasants and quail. In this case the farmer, the soil, and the birds have all been directly benefited. Sweetclover may be planted in eroding gullies, washes, wind-drifting soils, next to corn that is to be left standing, or next to any good natural cover.

Another soil-bulding practice is that of plowing under nitrogen-fixing crops, such as clover, peas, soybeans, alfalfa, sweetclover or any other leguminous crop suited to the locality in which it is to be grown. This practice, known as green manuring, may be used by birds rearing their young, as it provides a nesting site and food, if the crop is not plowed under until after the nesting season. Strips may be left unplowed until spring for ad-

ditional value to wildlife as they are places of refuge in winter.

Strip cropping is used to check the flow of water on slopes, to allowing the slow-moving water to drop its load of topsoil, and to give the water more time to soak into the ground. These strips may furnish nesting, shelter, emergency cover, and food for wildlife.

Gullies can usually be controlled by building check dams and planting the banks with trees and sowing grasses. Black locusts are popular as trees for gully control, in addition they furnish nesting sites for birds. Small shrubs such as buckberry may be planted in the gully. Again we have a sound soil conservation practice coupled with wildlife conservation.

On slopes and along the banks of streams the trees protect the soil from soil erosion and provide food and shelter for many of the furbearing mammals as well as birds. Nut trees are especially valuable as sources of food. Trees planted for windbreaks can accomplish the same purpose. Whenever possible hollow den trees should be left standing.

In the arid and semi-arid regions of our country, nature provided special kinds of grasses to protect the soil from wind erosion. Man plowed up or overgrazed these grasses and now we have our "dust bowl" with its resulting wind erosion. Needless to say the wildlife also vanished. These grasses must be planted again before people can earn a living there or any wildlife can be established.

The burning of pasture lands destroys the humus that should be returned to the soil, injures the grasses, and destroys food and cover for small animals.

The great principle of wildlife conservation is that there will never be more wildlife on a farm than the food and cover will support. The basis for this provision of food and cover is in the conservation of the soil.

We may well ask ourselves, "Are we protecting the soil our soldiers are fighting for?" For in the natural fertility of the soil, in its ability to grow crops, the welfare of every living thing, human or animal, must depend. The birds singing in the trees, the game birds and small furry mammals are a part of the American way of life. I want to see them here tomorrow as well as today. That is why I believe in soil conservation.

GRAND JURY TOLD ABOUT SOIL CONSERVATION

Soil conservation has been getting the active support of adherents from many quarters, but something of a record was set recently in Columbus, Ga., when Judge T. Hicks Fort based his entire charge to the Taylor County Grand Jury on the subject of soil conservation.

Pointing out that the circuit over which he presides is composed of only one "city county" and five rural or farming counties, Judge Fort said that he had been "giving intensive study and thought to the matter of farms and farming" since the county grand jury last met.

"It may seem out of place for one in my position to assume to advise practical farmers," he said in prefacing his remarks, "but oftentimes farmers, like other business people, are so close to their own difficulties that they may not see them clearly and a word from an outsider might provoke thought, and it is in thought and meditation that the best methods are often devised."

Calling attention to a recent article in the Reader's Digest, entitled "Friends of the Land," Judge Fort said the article forcefully expressed the idea that "our civilization is actually founded on about 8-inches of topsoil and when that goes our civilization will go with it.

"We can well illustrate the effect of soil destruction upon the economy of any community by observing what will take place on just one ruined farm," he said.

"At this time," he continued, "several million people are living on worn-out farms and seem helpless even to get away from them. They are economic liabilities and the rest of the nation is partially chargeable with their relief. Millions of children are without proper diet, schooling, or home conditions, all because of improper and improvident handling of a farm situation.

"What is the cause of all this?" Judge Fort asked, "The dark and red silt which colors the creeks and streams after every washing rain tells the story, and it is not dealing in imagination alone to say that as that silt-laden water moves down the streams of this county—streams like Cedar Creek, White Water, Patsalaga and others—along with it go banks, stores, residences, school houses, churches, and even families, which are the direct products of this land if preserved and properly farmed.

"There is a correction and a cure for this waste

(*Continued on page* 33)

MAKING RANGE ADJUSTMENTS IN UTAH

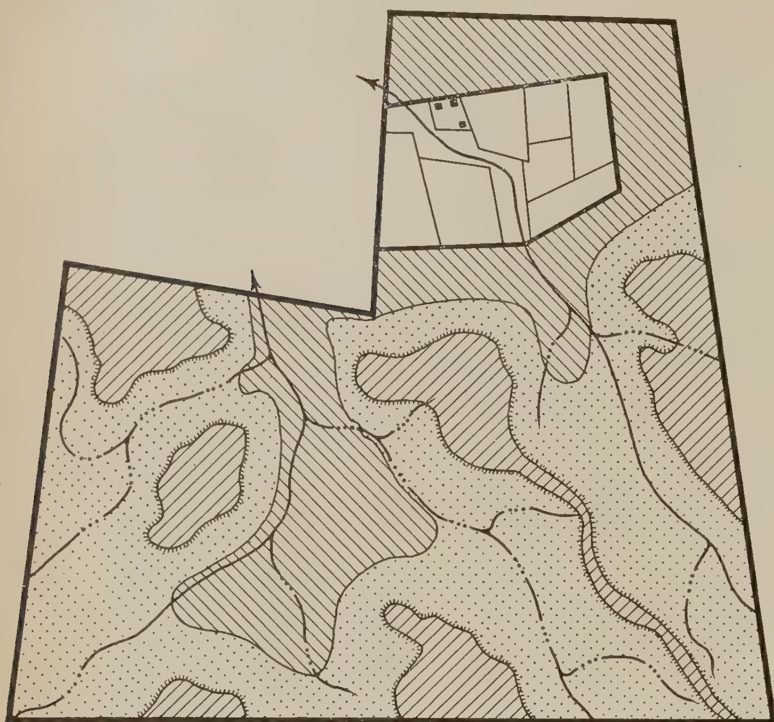


Fig. 1.—Four classes of forage producing lands on a typical Utah ranch unit. (See also cross section illustrated in Fig. 2.)

Areas capable of carrying two or three times their present capacity of livestock if intensively treated by clearing and reseeding.

Range lands which can be improved by usual methods of range management.

Areas which should be retired from grazing as part of watershed protection or some other more appropriate form of land use. These are generally the steep mountainsides adjacent to the valley bottoms.

Farmstead or ranch headquarters where wet or irrigated pastures, dry hay and other feeds can be produced to supply livestock removed from lands little suited to grazing.

By C. P. STARR and D. S. WINN

Most of the land in Utah is used for grazing, and as such, constitutes a major resource. Many acres provide excellent forage, and with little more than good range management will continue to produce at present capacity. There are, however, large acreages which are of questionable value so long as they remain in their present condition. They may have excessive slopes, unstable soil, or an undesirable or too sparse vegetative cover. Use may be unduly expensive because of the difficulty of applying good management. Climatic conditions may interfere with proper use and cause exorbitant livestock losses. Adapting lands to their best use and applying good range management require the most careful consideration.

The following summary represents an approach to objectives in range land use adjustment and provides some general recommendations for reaching the goal.

1. *Continued application of carefully selected range management practices:*

There are many acres of the so-called "poorer" range land that readily respond to such practices as rotation grazing, proper livestock distribution, proper seasonal use, water development, and similar acceptable practices. As an example, near Grantsville, Utah, a well defined "dust bowl" was converted to an excellent winter grazing area largely by the application of a few of the most obviously needed range conservation practices. There are many other areas throughout the state where the wisdom of this type of treatment has been substantiated.

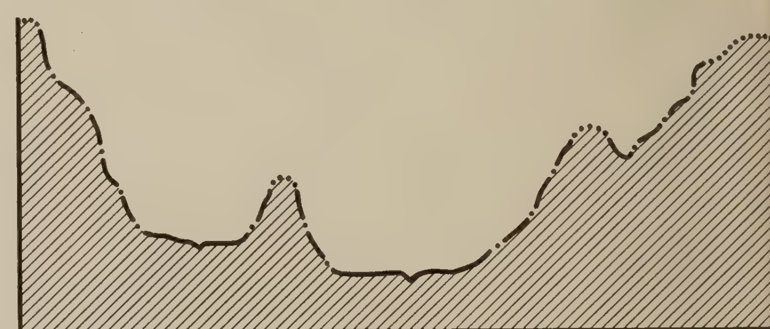


Fig. 2.—Typical cross section of Utah mountains and valleys.

Land which can be improved by usual methods of range management.

Areas capable of carrying 2 or 3 times present livestock numbers if given intensive treatment of clearing and reseeding.

Areas which should be retired from grazing and left to function as protected watersheds.

2. *Intensive treatment of areas adapted to desirable forage, with a view to increased grazing capacities:*

Intensive treatment of ranges as referred to here means clearing the range of less desirable species and replanting to perennial forage cover those areas which are adaptable because of gentle topography, suitable soil, and moisture adequate to maintain forage stands. Where lands are suited to this type of treatment, grazing capacities can be increased many times. This practice has been found to be extremely profitable and helpful in the range conservation programs of many soil conservation districts, among them the San Juan, Upper Sevier, Escalante River, Vernon, Grantsville, Sanpete County and Iron County districts.

Editor's Note.—The authors, both of the Soil Conservation Service, are, respectively, assistant state conservationist, Salt Lake City, Utah, and zone technician, Albuquerque, N. M.

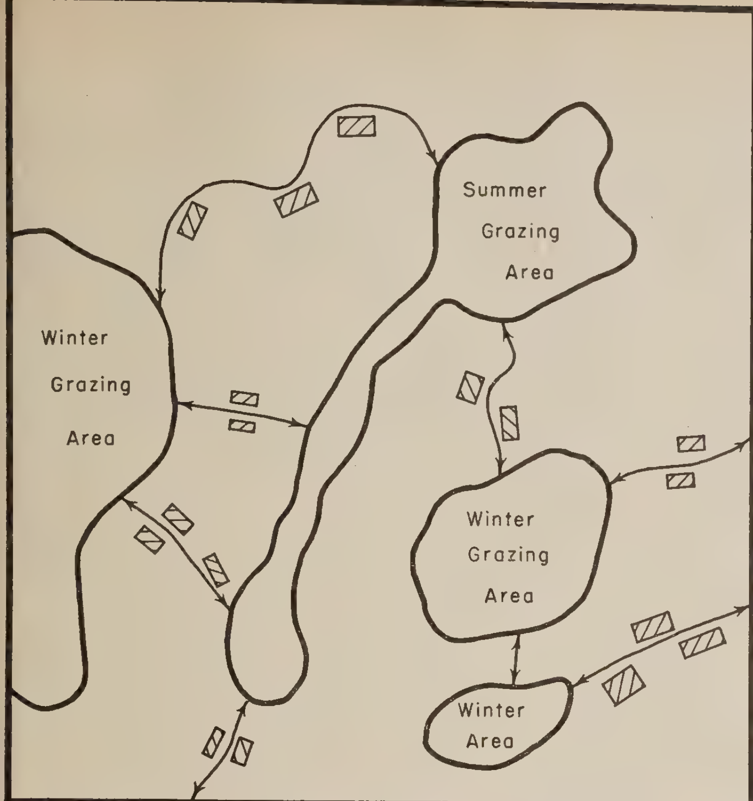


Fig. 3.—Pastures to supplement trail-grazing.

⟷ Typical routes of livestock movement between summer and winter grazing areas.

▨ Desirable location of dry, wet, or irrigated pastures along livestock trail routes.

3. *Retirement of lands unsuited to grazing, and possible translocation of livestock now using these lands:*

Lands more suited to producing forest products or those which, in their best condition, cannot be grazed without destroying their value as protection to a watershed and protection against run-off damage to more fertile farm lands at lower elevations, should be retired from grazing. This involves taking care of the livestock which depend on these lands for forage at the present time. In some instances, retirement can be accomplished by the improvement of local range lands or by the development of wet, irrigated or dryland pastures nearby. In other cases the movement of the stock to a new locality will be necessary.

Translocation of livestock from old established ranges to other areas where better grazing facilities can be provided is a rather drastic action. It entails considerable adjustment on the part of livestock operators, but may be necessary if grazing in areas of this kind is to be placed on a sound basis. Taken from a long-time point of view, it does make possible a successful adjustment of present livestock numbers to the over-all range capability to produce forage and would probably not result in an actual reduction of the total number of grazing livestock.

In addition to the adjustments on range areas, by far the most promising means of providing the needed forage for these livestock is the growing of supplementary forage on wet, irrigated, or dry pastures or on cultivated farm lands. Pastures on irrigated farms would be the solution in many places. In others, it might be possible and desirable to develop dry pastures on dry farm areas or on abandoned dry farm lands. The practicality of developing such range areas as are susceptible to intensive treatment by clearing brush cover and planting perennial grasses has already been proved. Such areas have relatively high grazing capacity and a large number of livestock can often be accommodated on small areas.

To illustrate, one Utah rancher has released his winter permit on public domain and now keeps his livestock on crop aftermath, forage harvested from irrigated pasture, and grain. He claims that his losses during the fall and winter and during the lambing period have decreased. He is able to market a better and heavier lamb crop and do it earlier, and his total marketable wool crop has increased noticeably.

4. *Provision for livestock forage along established trails:*

Livestock movement between summer and winter ranges is and has always been dependent upon rather extensive trail grazing en route. Excessive grazing, drouth, and increasing settlement along established trails have whittled down the forage. Heavy expense to operators for feed purchased en route, excessive loss of livestock along the way, and severe abuse to the land have resulted.

Trailing livestock from summer to winter range and back again may always go on to some extent. There are many operators who, after leaving the winter range and having no other place to go, depend upon the week or two involved in trailing to provide forage for their stock until the vegetation on the higher ranges develops sufficiently to permit grazing. Dry, wet, or irrigated pastures should be provided along the trails to furnish this needed forage and to replace the natural forage which has all but vanished from the scene. Such forage should at least protect livestock against hazardous losses of weight. If properly developed, they would also provide suitable lambing areas.

The Grantsville Soil Conservation District in western Utah is already giving thought to the matter of providing dry, perennial grass pastures within the district boundaries. It is believed that

(*Continued on page* 39)

WE MUST DO SOMETHING, SAYS BANKER

Boyd Rist is a young banker at Wymore, Nebr. Before he entered banking he was a county agent. Instinctively, he appears to think in terms of investment, dividends, the safety of the original capital. He believes too in the dignity of the individual and in the importance of private enterprise. Soil conservation is to him a synonym for sound agriculture. And the soil conservation district is a cooperative, common-sense way to insure the future of both the individual farmer and the agricultural community. Mr. Rist made the following statement at a recent hearing in Beatrice on a proposed addition to the Gage County, Nebr., Soil Conservation District.—The Editor.

I have discussed the soil conservation program with at least 150 persons in the south half of Gage County, including some of those in the southwestern part who are already in the soil conservation district, and all of them express it this way: They are a little doubtful about some of the conservation practices, about which they have heard but which they have not tried or have not even seen; nevertheless, all are for this program without exception. Something has to be done. There is a question, of course, as to what should be done. That is the reason for this meeting tonight.

I feel that we have made a beginning toward that something. I think it is a matter of holding back the water and keeping the soil. The soil is the basic resource, and the next thing we must have if we are to raise anything is water.

We have done so little about our soil and water resources, yet have made tremendous strides in the development of farm machinery, seeds and the rotation of crops. We know a lot about machinery, seeds, and rotations, and have done wonders.

Actually, farm machinery and seeds have maintained the production of this country far more than probably should have been expected in view of what we have lost. We have lost, during the last 3 years, three times as much fertility per year through the washing away of soil as we have taken out of the land with all of our crops. That is serious. Perhaps the reason we have not done much about conserving soil and water rests, to a degree, on our having square fields. A few surveyors gave us straight-line farming.

When the land was young, there was grass and it would hold back the water so that much of it could soak into the ground; the soil was fertile, and we felt that we did not need to watch it too closely. But now, in the last 10 or 15 years, some of our farms have been abandoned.

Here is another side. We thought, as did many others this year, that with so many young men called to the armed services there would not be enough farmers to farm the land. Lo and behold, we have listed 25 potential renters who have requested us to find them farms to rent. On the face of this, we first gained the impression that there was a surplus of renters. Analysis, however, shows that these farmers are renting now, but want to find better farms. We have farms in this county which were not farmed this year—poor farms. Their soil was thin and now much of it has been washed away.

That is what happens. The poorer land is abandoned first. We have got to do something about it. We must save this basic thing that makes crops possible. This program, fundamentally, is for that one purpose.

We should stop erosion in the valleys, too. I think it is a comprehensive program in any watershed. You can go to the highest point in an area, where a part of the watershed drains, and hold the water back by using recommended measures. Add a system of farm reservoirs to that, and you will be able to hold the surplus water—hold it where it falls, rather than spending millions of dollars getting rid of it after it is down in the valley.

It will take a very comprehensive program to get such results. I think it can be done, and a lot of benefit will be derived from it—preventing the soil from being washed away, getting more water into the ground, and perhaps even having water for irrigation. I hope that in the next several years a program of that kind can be worked out. It will mean increasing production 25 percent.

I read an item in a New York paper which indicated that yields could be increased at least 50 percent by holding our soil and getting moisture into the ground where it would be available when it is needed.

We have a rather peculiar situation in eastern Nebraska. We have good soil—very good soil—and plenty of rainful. Unfortunately, the rains come in bunches. There is hardly a year or season that does not have at least one dry spell of 2 or 3 weeks. We must try to assist Nature in spreading out the availability of water. This simply means holding the water where it falls, so that it will be available during those dry spells, when rains do not fall.

I was rather surprised recently to learn that some of our forefathers knew of this thing—that it is not entirely new. It is an old practice. I wrote down a few sayings. George Washington said that in 1797: "A half, third, or even a fourth of what land we mangle, well wrought and dressed, would produce more than the whole under our present system of management; such is the force of habit that we cannot depart from it." Here is another by Thomas Jefferson: "We now plow horizontally soils following the curvature of the hills and hollows on dead level, however crooked the lines may be. Every forrow thus acts as a reservoir to receive and retain the water; scarcely an ounce of soil is now carried off." Patrick Henry said: "He is the greatest patriot who stops the most gullies." Even those fellows knew and practiced conservation. They were all successful men.

I feel there is one important thing we have to consider—the individual. These men here have individual farms. Their primary interest is in things which will apply to their land. They want to raise a crop. The number of owners interested in this soil conservation program is surprisingly large, but it is even more surprising to learn that tenants are interested, too. In one place I talked with a tenant who lives on one of our farms. He said he is certain that he raises at least one-third more on that place than if the contouring and terraces had not been there. I said: "Wasn't it more work?" He replied: "Why, of course I had to figure out how to get around the point rows." He said also: "It is just a shame that this sort of work wasn't started 50 to 60 years ago, so that some of us who are farming would have something to farm with."

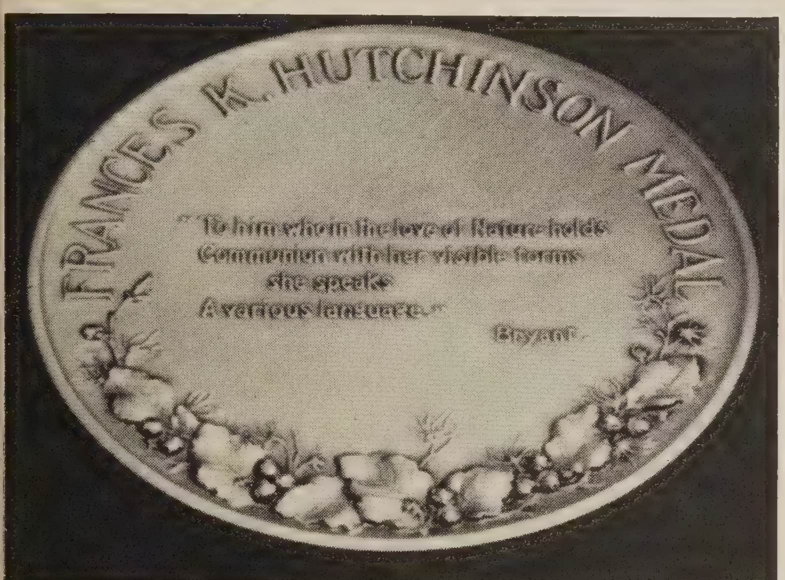
You men know, of course, that almost any farm practice, no matter what it is, is subject to defeat. You can get a friendly argument over any farm practice, whether it is deep furrows or what. Most any farm practice is subject to defeat, but the fundamental thing is that we must do something, and I think we want to.

CHIEF GOES TO SOUTH AFRICA

At the invitation of the government of the Union of South Africa, H. H. Bennett, Chief of the Soil Conservation Service, left July 1 for a two months trip to South Africa under the auspices of the Office of War Information.

Dr. Bennett is regarded as a world authority on soil conservation and land use, which are problems of major importance and interest in the Union of South Africa. He will exchange information with officials of the South African Government regarding social and technical aspects of the work now being done in both countries to control soil erosion and advance sound land use practices.

The War Food Administrator made Dr. Bennett's services temporarily available for the South African trip at the request of the Office of War Information.



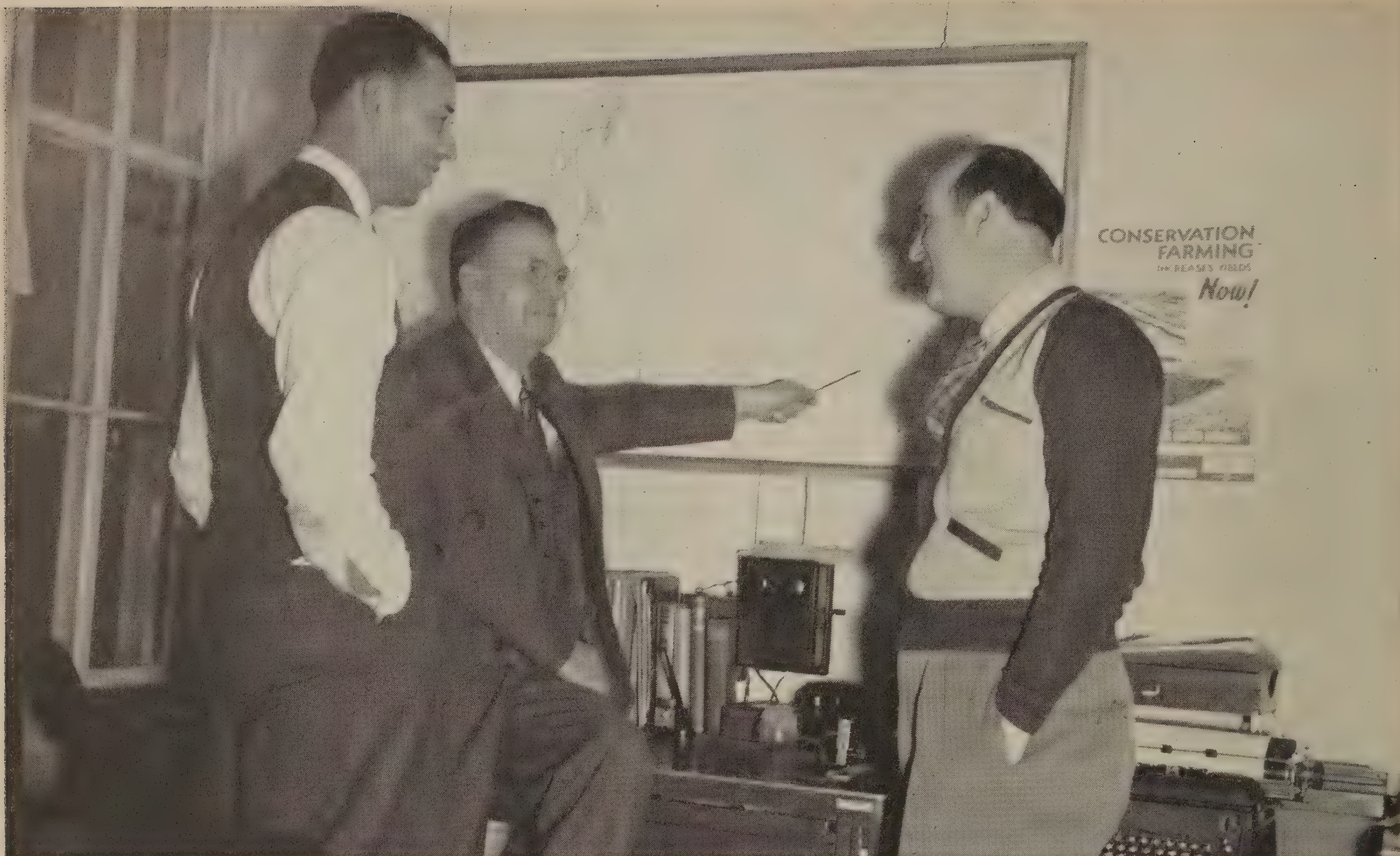
One of the most recent honors to come to Dr. Bennett was the award, at a dinner in New York City on May 16, of the Frances K. Hutchinson Medal "for service in conservation." The Garden Club of America conferred this recognition with appropriate ceremonies at a large gathering in a leading hotel. The two sides of the handsome disk are shown here.

Knowing full well the tragedy of wasting soils, it is nevertheless a cheerful Chief who faces the sun of what can be a happier era.

GRAND JURY TOLD
(*Continued from page* 29)

and this wanton destruction," he declared, "if it is only intelligently applied by those who are now living on the land and undertaking to make their living out of it. That cure is in applying proper methods of fire protection, terracing, draining, plowing, and treatment of the precious topsoil, which is the very basis of life and civilization."

Judge Fort also called attention to the stubble-mulch farming of Mack Gowder. "What has been done by this Georgia farmer on land no better than the average Taylor County land, can, and should be done by every farmer in this county," he said.



Elmer Deo (left), assistant county agent; Don B. Jewell, county agent; and Lee N. Rosencrans, district conservationist, consider the educational work to be done prior to the organization of the Leelanau County Soil Conservation District.

MANY GROUPS MERGE EFFORTS IN LEELANAU

By L. R. COMBS

Leelanau is an Indian word meaning "Land of Delight." And true the name, Leelanau County, Mich., is a delightful place—especially in spring and summer when cherry blossoms and brightly clad resorters enliven the scene.

Its agricultural history started with lumbering in 1850. Following that came grain and livestock farming, commercial fishing, fruit growing, and resorts where people from farther south fished, swam, boated, hiked, loafed, and cooled off in the breezes from Lake Michigan, which bounds the "little finger of Michigan" on three sides.

But like other areas where the land was not handled properly, wind and snow and rain also made a playground of Leelanau's originally thin but productive layer of topsoil.

They left gashes, bruises, and skinned places on the landscape and even piled silt on top of the snow during winters of light snowfall. Consequently, some people acquired a reasonable doubt as to how long the county might continue to deserve its name. Chief among these were the farmers and other year-around residents.

As Elmer Deo, county agent, said, these people realize that they don't have the best land in the world. But it is good land, and they have made a good living; they like to live here, and they want to keep what they have.

Maybe that is the reason why the people so wholeheartedly forward organization of a soil conservation district.

Leelanau's methods of organization were comparable to those which have proved so successful in the establishment of many other districts. Thorough education was a factor, of course. But this county brought also into play numerous other devices to get its district going. Leelanau certainly is an example of how districts can—and will, if given the chance—develop in response to popular demand.

When Don Jewell came to Leelanau in 1934 as

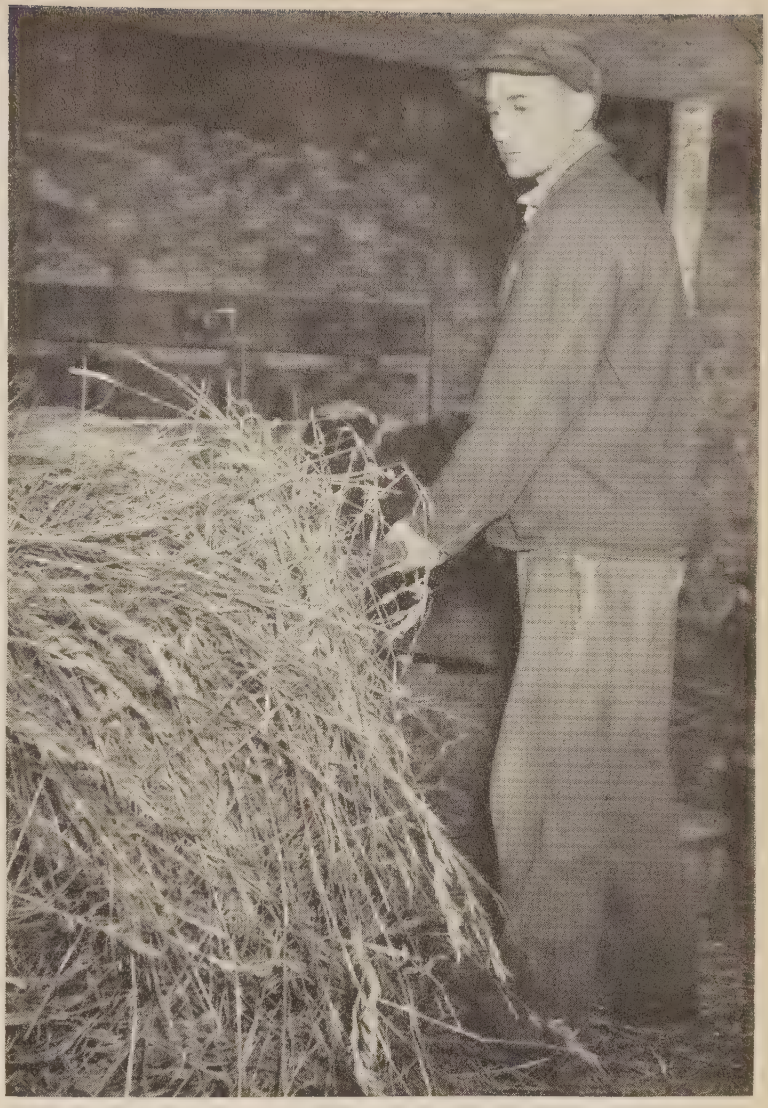
EDITOR'S NOTE.—The author is chief, division of information and education, Soil Conservation Service, Milwaukee, Wis.

half-time county agent (he also handled Benzie County) he took pictures of erosion all over the county and talked soil conservation. He conducted meetings and tours, continually "planting the seed of soil conservation." The seed bore fruit, meetings and tours, and in 1938 he and Paul Barrett, extension soil conservationist, conducted the first organized series of meetings on this subject. He interested the county land use-planning committee in the problem and visited the Benton Harbor demonstration project to see just what could be done by the modern methods of soil conservation planning. Lars Halvorsen, of Cedar, and Frank Ryant, of Maple City, started soil conservation plans on their farms, with the help of Jewell and Soil Conservation Service men from Traverse City. These extension demonstration farms showed farmers the possibility of farm planning for erosion control.

Deo came to the county in 1942 as Jewell's assistant and saw two major needs—erosion control and more dairying, with its accompanying increase in hay and pasture. Last year he took over when Jewell became full-time agent in Benzie County.

In the meetings in the winter of '41 and '42, Deo, Jewell, and others began to talk soil conservation and what districts were doing elsewhere. They took 33 AAA committeemen to the old project and

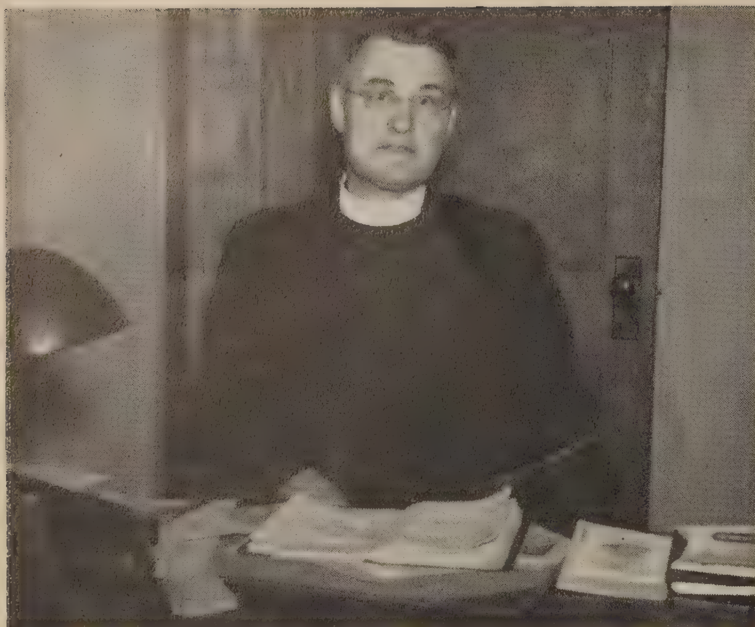
Frank V. R. Viers, Jr., soil conservationist (left), and Elmer Deo, county agent, discuss farm plan worked out with Edwin Bremmer, East Leland, a district cooperator.



F. Herrick Waterman, who farms east of Leland and is chairman of the district directors, grows alfalfa-brome mixture as part of rotation to conserve soil and provide hay for Guernseys.

the year-old district in adjoining Grand Traverse County to see what a complete soil conservation program could really do for a farm. Groups of Grange and Farm Bureau members also visited the Grand Traverse area. This resulted in developing three or more men in each township who could discuss districts intelligently.

Deo and Lee N. Rosencrans, district conservationist, explained districts to the agricultural committee of the county board of supervisors, of which Harry Lautner, Elmwood Township, was chairman. The committee visited Grand Traverse, talked to the new district cooperators and old project cooperators, after which they presented the idea to the county board of supervisors. The board endorsed the district idea, not because of any required precedure but because it heartily approved. It urged Deo and Jewell to continue with organization of a district. The supervisors also helped arrange meetings, line up men to circulate petitions, and when the referendum was held, 9 of the 11 polling of-



Father Edward Neubecker, Lake Leelanau churchman and ardent sportsman, helped organize the soil conservation district

ficials were county supervisors who owned farm land.

Catholic rural priests helped with the district organization by preaching on soil conservation and by holding meetings in church basements and community halls. Father John Klanowski, of Holy Rosary Church, Isadore, had been talking "plowing across the hill" and other soil conservation practices long before districts were heard of. Father Edward Neubecker, of Lake Leelanau, an ardent hunter and fisherman as well as an exponent of stewardship of the soil, and Father Charles Baker, of Suttons Bay, were other leaders who helped make the campaign a success.

Forty people attended a meeting at Father Baker's church one evening. Three-fourths of them had to walk through a snowstorm so blinding that Deo and Leonard J. Braamse, extension soil conservationist, doubted whether they would attempt to travel the 8 miles from Leland to Gills Pier.

Men and women to carry petitions asking for organization of a district were selected by noting the ones who displayed "salesmanship" ability at the various educational meetings. These included representatives of the Grange and Farm Bureau, AAA committeemen, local extension leaders, and county supervisors.

The county Farm Security Administration supervisor and the secretary-treasurer of the Farm Loan Association sent out notices of soil conservation meetings and emphasized the importance of soil conservation and the value of a district to their clients, many of whom circulated petitions, signed petitions, and attended the hearing.

The three Leelanau County newspapers and the Traverse City paper reported developments in detail, as did radio station WTCM, which gave broadcast time and spot announcements. After the district was organized, the station requested help in stabilizing the sandy land around its transmitter in southern Leelanau County.

Herrick Waterman, of East Leland, president of the county Farm Bureau, and Charles Noonan, of Empire, master of the Pomona Grange, encouraged members of their organizations to support the district and urged its formation.

Other informational devices included circular letters by the county agent, special exhibits and window displays with which the Traverse City Soil Conservation Service office helped, the use of movies, slides, and charts.

Given 1 month to turn in the lists, the petition carriers rounded up 800 signers among the 1,119 farmers—the largest number of signers in Michigan up to that time and probably one of the largest percentages in the United States.

The original petitioners asked for the exclusion of towns and villages, but some of the county supervisors and local leaders insisted that all land in the county be included. Several of the villages encompassed agricultural land. Empire actually boasted an entire farm.

Five islands just offshore—North and South Fox, North and South Manitou, and Bellow—afford hunting, produce timber, and do a certain amount of farming. So Leelanau County became perhaps the only soil conservation district to include islands within its boundaries.

The State committee held the hearing in December 1942. Nearly 200 people packed the small courtroom in Leland during a snowstorm when side roads were blocked. No "anti" talks were forthcoming, and an appeal for a show of hands failed to bring a single "no" vote.

Because of the 100-percent support of the district, the State committee set some kind of a record for speed in the snowbound town of Leland that December day. Meeting in the evening, it approved the organization of the district and set a date for the referendum. Simultaneously, the local people decided on polling places and recommended polling officials whom the State committee approved before leaving.

At this point, one slight, but not serious, error appeared. Having been informed of the high number of petition signers and the outcome of the hearing, the people figured their job was done and

(*Continued on page* 39)

MORE IDAHO SPUDS WITH GREEN MANURE CROPS

By FLOYD W. DORIUS

Visualize, if you will, the many trips to the grocery store that would be required to carry 6,000 pounds of potatoes to a war worker's kitchen and the endless hours of K. P. duty that would be needed to peel that many "spuds" for Army mess! That would give you a fair idea of what it would mean to war food production, were every acre of Idaho's potato-growing land to come through with the increased production that Nephi R. Ipsen, supervisor of the Oneida Soil Conservation District, realized from sweetclover land on which he raised potatoes in 1943. On 5 acres Ipsen harvested 5,991 more pounds of potatoes to the acre by turning under sweetclover as a green manure crop than he harvested on the rest of the field, without this treatment.

Though hay, grain and livestock are the main farm products in the Oneida district, pressure for war crops has stimulated potato and sugar beet production on irrigated land. With acreage, available equipment, labor, and irrigation water reaching their limits, the greater food crop production must come through better use of the land and other resources. The primary war-time goal of the soil conservation district is to assist farmers and ranchers to work out their problems through the application of such measures as green manure, and range management.

Assuming that sweetclover were to be used as a needed green manure crop, and that the resultant increase in potato yields would average 30 bags an acre (or only half of the 60-bag increase Supervisor Ipsen obtained), Idaho's 1944 output would be hiked by some 5,400,000 hundred-pound bags. The State's 1944 potato goal is 180,000 acres. Variations in soil types, soil moisture conditions and past rotation or other cropping practices determine, however, how much green manure can be plowed under or whether it is advisable to plant a green manure crop at all. That is where the soil conservation district and the Soil Conservation Service staff assigned to it come in.

Supervisor Ipsen's experience, though outstanding, is one of many vouching for the value of green manure.

"On about April 15, 1942 I planted six pounds of sweetclover seed with 90 pounds of Velvon barley per acre and secured a fair stand of each," Ipsen reported. "During August of 1942 I harvested 13,000 pounds of barley from the whole 6-acre field.

The harvest tells the story. Potatoes at left came from that part of the field on which sweetclover had not been grown; those on right from the part that had been in the green manure crop—each a typical hill. The difference in yield was approximately 6,000 pounds.

"On about May 15, 1943 I mowed the sweetclover which had reached the height of 14 inches, and let the stubble and clover lie on the ground until the clover was quite dry. I then plowed it under to a depth of about 8 inches and proceeded to prepare the land for planting to potatoes. On about May 25 I planted the potatoes, using Russet seed one year removed from certification.

"I noticed that the clover roots began to decay immediately and did not cause any trouble in cultivation. Throughout the season, the ground remained soft and pliable, absorbing the water more readily than that portion of the field where no clover had been planted. The yield and grade of potatoes were very satisfactory. I dug up numerous hills from both patches and compared them. Always the difference in yield was noticeably in favor of the land that had been in sweetclover.

"I am convinced, therefore, that planting sweetclover for a green manure crop is a very profitable conservation practice."

The clover was clipped instead of being plowed under green, because Ipsen, who is secretary of the district board, did not have the help and machinery to turn it under before it would become too coarse to handle. Which method of handling is the better remains to be determined.

Toward the end of the growing season, the potato vines on the sweetclover part of the field were still a healthy green color. But the vines on the rest of the field were brown and apparently dead. The "clincher" came with the harvest. Two random rows of potatoes from each part of the

Editor's Note.—The author is work unit leader, Soil Conservation Service, Malad City, Idaho.

field were weighed, and estimates made on the basis of prevailing prices, potatoes sold at $2.25 a hundred for No. 1's, $1.25 for No. 2's and 25¢ for culls. The returns per acre on the Ipsen field were:

		Without sweetclover	*With sweetclover*
Total yield		30,129 pounds	36,120 pounds
Grades:	No. 1's	76%	75%
	No. 2's	8%	11%
	Culls	16%	14%
Cash		$557.37	$671.82

Allowing $1.20 for the clover seed and 75¢ extra cost for the mowing, the extra profit from growing the green manure crop was $112.50 an acre. In terms of war food, that achievement meant an additional 5,991 pounds of potatoes or, roughly, 60 hundred-pound bags on each of the treated acres.

In addition to increasing soil fertility and production of succeeding crops, biennial sweetclover furnishes excellent pasture the first year. The structure of the soil is improved; the water-holding capacity of sandy soil is increased, and the rate of water intake on clay soils is increased. Under irrigation, green manure reduces the time it takes water to soak through the potato bed, and the depth of gravitational water penetration is reduced, resulting in saving of irrigation water. The improved soil structure usually lessens erosion on irrigated fields, and bacteria beneficial to plant growth are encouraged.

Similar increases in potato yields can be obtained by using barnyard manure on most fields, though limited supply and high labor requirements make leguminous green manure crops an additional necessity when a short rotation is being followed. General opinion is that irrigated ground needs 20 tons of barnyard manure an acre to equal the value of such a green manure crop. Some Oneida district farmers have overcome the labor problem to some extent by feeding dry stock right on the fields when the ground is frozen, and others have rigged up mechanical loaders on their tractors to do away with the hand pitching.

With both green manure and barnyard manure, precautions have to be taken in irrigating. When the green manure crop is plowed under, the soil moisture should be controlled; and irrigation water sometimes needs to be added before plowing, because soil that is too dry decreases bacterial action and delays rotting. Soil saturated with water, on the other hand, shuts off the air and reduces oxidation. The soil should be warm when the clover is turned under, to encourage bacterial action. If irrigation water is short the latter part of the growing season, excess manure may cause burning.

Growing green manure crops is but one of the many soil conservation practices that farmers in this soil conservation district are using to improve their land and boost war crop production. The practices include the improvement of irrigation distributing systems, the planting of erodible land to grasses and legumes, the leveling of land, the building of stock ponds, and the using of stubble-mulch tillage.

REVIEWS

NATURAL PRINCIPLES OF LAND USE. By Edward H. Graham. Oxford University Press, New York, 1944. 274 pp.

During the last two decades, ecological science and land-use planning have expanded rapidly. Each has become a self-conscious enterprise led by a professional class, and each has claimed to be the necessary foundation for the popular movement known as conservation.

There is obvious logic in these claims. The fly in the ointment is that ecologists know little of land-use, land-planners know little of ecology, and lay conservationists know little of either.

These three enterprises are not, however wholly isolated from each other, for there exist in the forestry, range management, agronomy, and wildlife management professions certain individuals who know something of ecology, of planning, and of conservation. To these has been offered an opportunity of almost terrifying magnitude: to write a book integrating all three into one logical system.

I doubt whether anyone who has not tried it can quite grasp the sweep of such an undertaking. Dr. Graham, in the present volume, has wisely refrained from attempting an exhaustive treatment, i.e. he does not close any circles of documented logic. He attempts, rather, a thumbnail sketch of the certain selected researches, land-use practices, and conservation policies which illustrate *modes of thinking*, good and not so good, pertinent to his title: "Natural Principles of Land Use."

This title, to my way of thinking, is a very happy one. It implies clearly that there are natural and unnatural principles which may be applied to land, and that only those harmonious with the inner merchanisms of the land itself can succeed in the long run. It implies that ecology, and not economics, is the final arbiter of success in land management.

Such a jumping-off point of course raises the question: What is ecology? How does one distinguish a natural principle? The book is an attempt to describe the search for answers to these questions.

My impression is that Dr. Graham is successful to the extent that he deals with specific cases. I find nothing particularly impressive in his first four chapters, which

deal with general concepts, nor in Chapter V on techniques. Chapter VI on land classification strikes me as pedantic, with a strong bureau flavor elsewhere absent. The succeeding chapters on farms, forests, ranges, waters, exotics, and control practices are the heart of the book.

I have seen no better sketch of forest ecology than Dr. Graham presents in Chapter VIII. The materials are so rich and varied that many a major field of inquiry gets only two or three sentences, nevertheless the net effect is coherent and convincing, and the reader is literally given the meat of the author's wide erudition in this field. Nevertheless there are a few distortions of fact. Thus the Kaibab is credited with protecting deer-predators after the 1924 irruption; not only is this not true, but the Kaibab tragedy was allowed to repeat itself on the adjoining deer ranges of Utah without any diminution of predator-control. Again: Dr. Graham repeats the fond fancy that forest plantings can be interlarded between highs of the snowshoe hare cycle. Just what tree can grow out of reach of hares in five years?

The sketch of range ecology is equally effective. It cites the following gem of non-ecological reasoning: "Weeds cause serious reductions in grazing capacity." The shoe, Dr. Graham points out, is on the other foot: Weeds do not *cause* reductions in grazing capacity, they are the *result* of such reductions; the cause is overgrazing. In this simple inversion of cause and effect is told the sad history of forty percent of the area of the United States.

I will not easily forgive the publisher for separating two photographs of this chapter: Plate 22, showing a Navajo village fifty years ago, and Plate 23, showing the same site now occupied by a yawning arroyo. Such rare and valuable "before and after" photographs deserve more respectful handling.

The chapter on pest control says more in twelve pages than many an ecological writer has said in his lifetime. Its philosophy is that of Hinton: "If you create a vacancy, it is your own very difficult business to keep it vacant." Its appraisal of the status quo is illuminating: "we have few universities and no governmental bureau which undertake specific research on numbers of vertebrates," i.e. population problems. (I add my fervent amen.) This quotation, and this chapter, are appropriate examples of how Dr. Graham achieves a very critical appraisal of land-use practices and policies without scolding, without crying over spilt milk, and without apocalyptic prophesies of doom.

The final chapter, "The Land and Human Welfare," is a remarkably concise sketch of the social implications of land conservation. It ends with this prophetic note: "Conservation is more than wise use of natural resources. It may well be the foundation of a new social philosophy. Our [institutions] were developed around exploitation. [Conservation] may well develop a way of life as different from the prevailing one as that is different from the cultures of the past."

Everything taken together, this is a remarkably good book. It is certainly the best, and briefest, of the "conservation series." Barring the first few chapters, it offers the layman a clear picture of conservation, and many a professional biologist who has become cramped into some narrow specialty will do well to read it for reorientation.

ALDO LEOPOLD,
University of Wisconsin

LEELANAU (*continued from page* 36)
couldn't see the need of a referendum. All available educational methods and activity of all the various local leaders were brought to bear on "getting out the vote."

On January 28, 1943, the people voted the district in by a count of 334 to 2. And these people all went to the polls; none were absentee ballots.

The state committee appointed Harold Gilbert, Empire, and Howard Reincke, Sutton Bay, district directors, and farmers elected F. Herrick Waterman, East Leland, Otto Lautner, Elmwood Township, and Frank M. Schaub, Lake Leelanau. The board of directors elected Waterman president and Reincke secretary. They signed a supplemental memorandum of understanding with the Soil Conservation Service on July 5, 1943.

Up to December 31, the district directors had received 50 requests from farmers wanting complete plans and 131 requests for help on single practices as an emergency war production measure. Local leaders estimate that with the help of AAA committeemen, the county agent, and others trained by Soil Conservation Service men, a total of 600 farmers applied starting or production-conservation practices last year. The directors have made no "campaign" for requests, staying just enough ahead to keep Farm Planner Viers and his assistant busy.

And there, for all practical purposes, this story ends. How many of the farmers adopting simple practices will want complete plans, how much of the county will be safely under a soil conservation blanket in a few years, how soil conservation clubs already are being organized in schools and how sets of soil conservation booklets have been placed in every school by the county school commissioner —those things can better wait until another time.

The later story will also include an account of how the district directors are taking hold of the administration of the district, and how 4-H clubs, schools and churches are pushing the program.

RANGE ADJUSTMENTS (*Cont'd from page* 31)
this will partially relieve serious local trailing problems, provide a valuable source of income to land owners, and supply much-needed forage for livestock trailing from winter to summer ranges.

The most important job facing the range livestock industry today is to see that all range areas produce now the maximum amount of beef, mutton, and wool. We cannot afford to lose sight of the kind of management leading to continued high production.

REFERENCE LIST ☆☆

Compiled by William L. Robey, Printing & Distribution Unit

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SOIL CONSERVATION SERVICE

Farm Business Summary, Fennimore Area, 1943: Part I—Small Farms. Soil Conservation Service, with the cooperation of the Wisconsin Agricultural Experiment Station and the Wisconsin State Soil Conservation Committee, La Crosse. April 1944. mm.

Farm Business Summary, Fennimore Area, 1943: Part II—Large Farms. Soil Conservation Service, with the cooperation of the Wisconsin Agricultural Experiment Station and the Wisconsin State Soil Conservation Committee, La Crosse. April 1944. mm.

The SAF Stilling Basin. Soil Conservation Service, with the cooperation of the Minnesota Agricultural Experiment Station, St. Anthony Falls Hydraulic Laboratory, University of Minesota, Minneapolis. December 1943. mm.

Tenth Annual Report of the Coon Creek Farm Account Work, 1943. Soil Conservation Service, with the cooperation of the Wisconsin Agricultural Experiment Station, La Crosse, Wis. May 1944. mm.

OFFICE OF INFORMATION U. S. DEPARTMENT OF AGRICULTURE

Bibliography of Agriculture. Volume 4, No. 6. U. S. Department of Agriculture Library. June 1944. Processed.

Conservation of Wildlife. Reprint from House Resolution No. 20, 78th Congress, 1st Session. December 1943.

Cultivated Grasses of Secondary Importance. Farmers' Bulletin No. 1433. Bureau of Plant Industry. Slightly revised April 1944. 10¢.[1]

Decay in Balsam Fir in New England and New York. Technical Bulletin No. 872. Bureau of Plant Industry, Soils, and Agricultural Engineering, Agricultural Research Administration. May 1944. 10¢.[1]

Dry Land Rotation and Tillage Experiments at the Akron (Colorado) Field Station. Circular No. 700. Bureau of Plant Industry, Soils, and Agricultural Engineering, Agricultural Research Administration, with the cooperation of the Colorado Agricultural Experiment Station. May 1944. 10¢.[1]

Making High-Grade Hay. AWI-97. Office of Distribution, War Food Administration. May 1944.

Moderate Grazing Pays on California Annual-Type Ranges. Leaflet No. 239. Forest Service. June 1944. 5¢.[1]

Physical Land Conditions in Muskingum and Guernsey Counties, Ohio. Physical Land Survey No. 32. Soil Conservation Service. 1944. 35¢.[1]

[1] From Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.

Thomas Jefferson: Soil Conservationist. Miscellaneous Publication No. 548. Soil Conservation Service. April 1944.

STATE BULLETINS

Bimonthly Bulletin of the Ohio Agricultural Experiment Station, Wooster, Ohio. Vol. XXIX, No. 228. May-June 1944.

Do You Know What Erosion is Doing to Your State and What Has Been and Should Be Done About It? State Soil Conservation Committee, Charleston, West Virginia. May 1944.

Economic Considerations in Planning for Soil Conservation in the Chehalem Mountain Project, Oregon. Station Circular No. 156. Oregon State System of Higher Education, Oregon State College, Corvallis, Oreg., with the cooperation of the Soil Conservation Service, U. S. Department of Agriculture and the Oregon Agricultural Experiment Station. November 1943.

The Economic Effect of Soil Erosion on Wheat Yields in Eastern Oregon. Station Circular No. 157. Oregon State System of Higher Education, Oregon State College, Corvallis, Oreg., with the cooperation of the Soil Conservation Service, U. S. Department of Agriculture and the Oregon Agricultural Experiment Station. November 1943.

Leaf Spot Control for Increased Peanut Yields. Circular No. 145. Georgia Experiment Station, Experiment, Georgia. May 1944.

Lysimeter Experiments—V: Comparative Effects of Ammonium Sulfate and Sodium Nitrate on Removal of Nitrogen and Calcium from the Soil. Memoir No. 252. Agricultural Experiment Station, Cornell University, Ithaca, New York. June 1943.

Mida Wheat. Circular No. 68. Agricultural Experiment Station, North Dakota Agricultural College, Fargo, N. Dak. March 1944.

Pasture Fertilization. Bulletin No. 460. Agricultural Experiment Station, Pennsylvania State College, State College, Pa., with the cooperation of the Bureau of Plant Industry, U. S. Department of Agriculture. January 1944.

Soils of Broadwater County: Soil Reconnaissance of Montana. Bulletin No. 421. Agricultural Experiment Station, Montana State College, Bozeman, Mont., with the cooperation of the Bureau of Plant Industry, Soils, and Agricultural Engineering, U. S. Department of Agriculture. March 1944.

Soils of Meagher County: Soil Reconnaissance of Montana. Bulletin No. 420. Agricultural Experiment Station, Montana State College, Bozeman, Mont., with the cooperation of the Bureau of Plant Industry, U. S. Department of Agriculture. February 1944.

Sorghum Seed Treatment. Circular No. 52. Agricultural Experiment Station, South Dakota State College, Brookings, S. Dak. May 1944.

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SEPTEMBER 1944

SOIL CONSERVATION

OFFICIAL ORGAN OF THE SOIL CONSERVATION SERVICE

SOIL CONSERVATION

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SECRETARY OF AGRICULTURE · WAR FOOD ADMINISTRATOR · CHIEF, SOIL CONSERVATION SERVICE

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WELLINGTON BRINK EDITOR

CONTENTS

Front Cover: Small stream improvement dam structure on West Trout Brook, designed to cut a pool below. Photographer: G. Lowary.

Soil Conservation is issued monthly by Soil Conservation Service of the United States Department of Agriculture, Washington, D. C. The matter contained herein is published by direction of the Secretary of Agriculture as administrative information required for proper transaction of the public business, with the approval of the Director of the Budget. Soil Conservation seeks to supply to workers of the Department of Agriculture engaged in soil conservation activities, information of special help to them in the performance of their duties. Copies may be obtained from the Superintendent of Documents, Government Printing Office, Washington 25, D. C., 10 cents a copy, or by subscription at the rate of $1.00 per year, domestic; $1.50 per year, foreign. Postage stamps, will not be accepted in payment.

Research Grows Up on the FARM

Showing great promise for the South, this early-maturing strain of crotalaria is getting a good work-out in the Soil Conservation Service nursery at Sibley, La.

By R. E. UHLAND

Highly unique in the scientific firmament is the research program of the Soil Conservation Service, which does not consider an experiment complete until it has moved out from the miniature plot or field to obtain maturity on the farm itself. This was true in a limited way in the early 30's, and it is even more true in these days of war's stern testing.

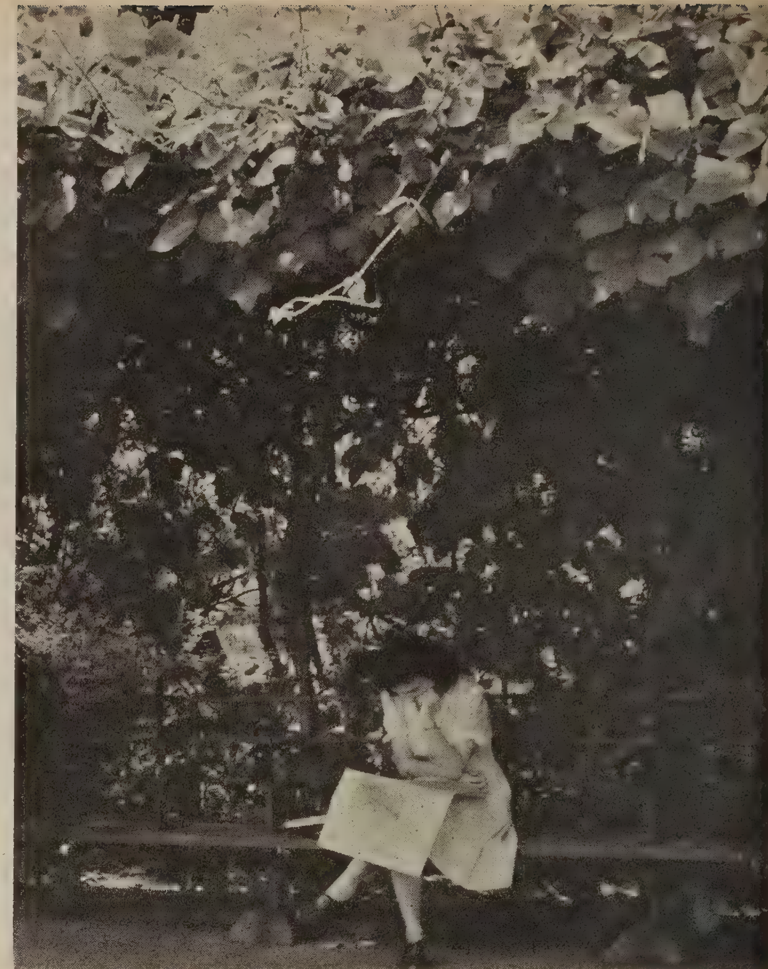
Soon after Pearl Harbor it was not unusual to hear the view advanced that soil conservation was "out for the duration." This strange idea, of course, sprang from the urgency of the need for immediate agricultural production as contrasted to storing for the future. The erroneous impression was widely held that increased production could be obtained only by increasing crop acreages. It failed to consider that these additional acres might be unsuited for cultivation and would, therefore, miserably disappoint.

It is now well established, however, that increased production, both now and in the future, can best be had by practicing soil conservation. Early experimental data from soil conservation stations in Texas, South Carolina, Oklahoma, Missouri, Iowa, Illinois, Ohio, Wisconsin, and Washington showed the rapid rate at which soil and plant food were being lost from cropland by erosion. Studies carried out in cooperation with state experiment stations showed that with proper cropping and cultural operations, supported by needed mechanical structures, soil and water losses could be reduced to a minimum and the per acre yield of crops could be markedly bettered.

More recent data from these and more lately established experiment stations show how widespread is this soil destruction—and how the dividends fall off as the soil capital disappears. They effectively disprove the theory that the only way to add to the harvest is to add to the acreage. Con-

Editor's Note.—The author is research-operations liaison officer, Soil Conservation Service, Washington, D. C.

KUDZU: The ornamental, the trellis-climber, the "porch" vine, continues to function thus beneath the eye of the Lady of Liberty atop the Capitol dome. It is none other than kudzu that makes this shady bower overlooking the seat of National government. But out yonder, on the erosion-worn fields of the great South, kudzu is finding useful work it never dreamed of until recently.



servation farming is found to increase each acre's yield by a good 20 percent. Obviously, the application of conservation measures which increase yields and at the same time reduce soil and water losses constitutes a major contribution toward the problem of emergency — and post-emergency — food production.

So convincing were the research findings of these stations that as early as 1933 it was considered a national duty to get the erosion control measures that had proved so effective on small plots and fields into actual use on the farms themselves. Provision was made for the establishment of 10 large demonstration projects, most of them located near soil erosion experiment stations. The purpose was to show that the research findings on the station tracts could be used profitably by farmers within these projects.

From the beginning, the Soil Conservation Service freely drew on the notable work of state research centers, and on the studies of other agencies. It acquired the habit of searching through the findings of science for conservation ideas which could be given immediate test on experimental plots and later on farm fields.

As might be expected not all conservation measures of promise succeeded. Some practices that worked well in one place or on certain soil types didn't do so well on other soils at different locations. Through the simple planning and carrying out of evaluation studies and field trials on these projects, and through the extension of fundamental cooperative experiments on the station farms, the needed modifications for applying many soil conservation practices were determined.

With the early extension of projects to new areas, many new problems arose. This called for a marked extension of cooperative research, and for evaluation studies and field trials. Opportunity was given to most Service personnel to get a certain amount of experience in both research investigations and in field application of research findings. The operations field technicians assisted in establishing and carrying out the evaluation work and the field trials. Thus, it has been possible continually to improve soil and water conservation practices and to hold costly mistakes to a minimum.

The action program of the Soil Conservation Service at present is centered around soil conservation districts. These districts totaled 1,114 on June 15. They are distributed in 45 States. The acreage of land within districts represents almost one-half of all the agricultural land in the United States.

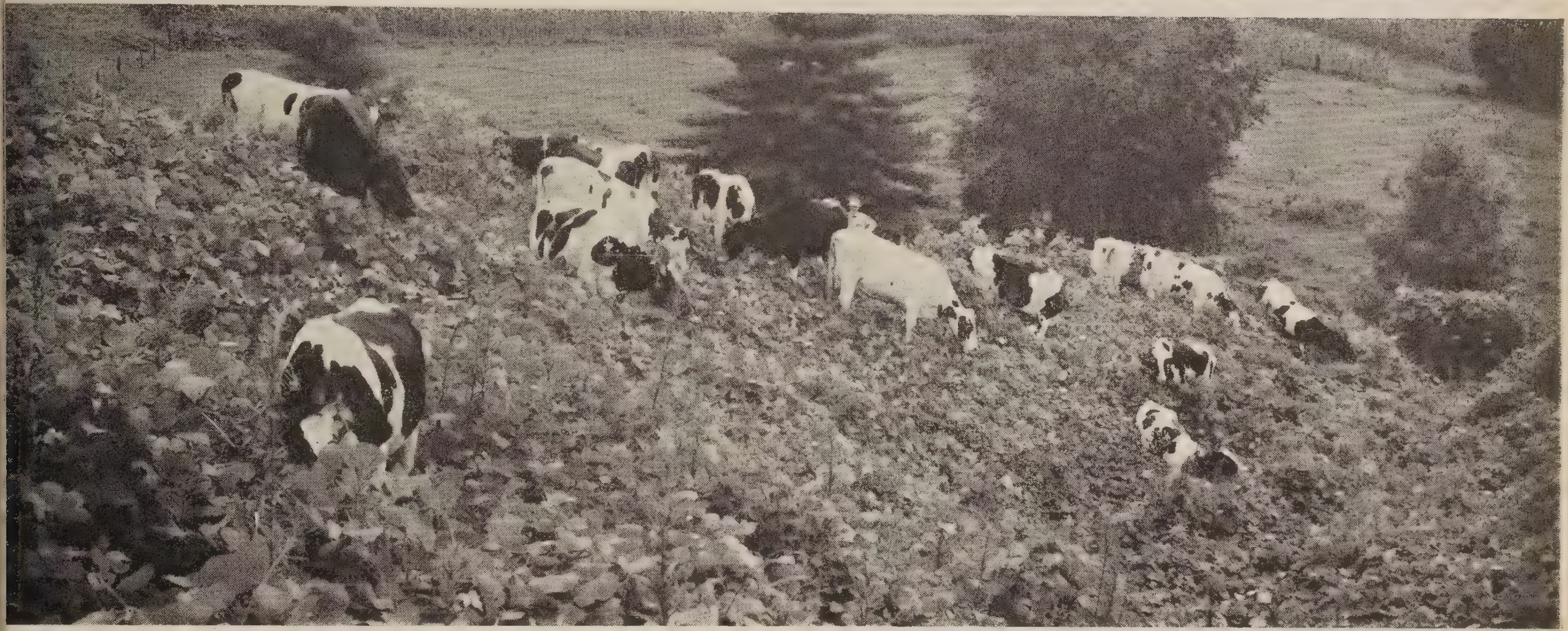
In rendering service to soil conservation districts, our field technicians must rely constantly upon research information from the various experimental fields and from cooperating farms on former demonstration projects. Research, they

find to be a most valuable aid in planning and putting into effect a program of soil improvement and conservation.

It is important that Soil Conservation Service technicians, especially district conservationist and work unit leaders, be familiar with all the research dealing with soil and water conservation in or adjoining their areas. If the problems and conditions found in a particular district differ markedly from areas where information is available the district conservationist should call this to the attention of the project leader of research and the State soil conservationist.

KUDZU: Heals gullies, rebuilds soil, adds income. Experiment and farm experience have brought kudzu out of comparative idleness and given it a miracle-working task of terrific proportions.

KUDZU: It supplies an abundance of high protein pasture. How those cows do love it! Northern farmers wish they had its counterpart.



Many of these problems can be solved through simple field trials on farms within the district. The operations field technicians often assist the research personnel of the Service and of the State experiment station in locating and carrying out these studies.

If it appears that more fundamental information is needed before field trials can start, the research personnel of the Soil Conservation Service and the state staff are prepared to make a thorough analysis of the problem and submit their recommendations to the Washington office. Many times it will be found that at other locations related work has been initiated and information developed which will contribute toward solution. Take, for example, the research studies on the utilization of crop residue which are being conducted in about 30 states and at several locations in each state. Obviously, conditions vary widely from place to place, and the findings must be studied for their practical application to particular points and areas. To meet special problems, it has sometimes been necessary to initiate experimental work in areas not served by established stations.

The importance of the district soil conservationist being thoroughly familiar with existing research work was illustrated recently at a typical meeting of a district governing body. All of the district supervisors were present, along with two community leaders, the district conservationist, the county agent, and a member of the state committee. In the discussion that took place at this meeting it was obvious that the district supervisors and the community leaders overlooked the fact that one of the original soil and water conservation experiment stations was located

Seed strippers mounted on old automobiles have proved helpful in collecting seeds needed for the revegetation program on the Plains.

Research pioneered the subsurface tillage idea; quickly delivered it for trial in the field. This subsurface tillage machine with wing sweeps leaves much of the stubble on the surface instead of turning it under, as with the moldboard plow.

New farming methods call for new implements. Dr. Bennett gives his attention to one of the subsurface tillage machines in use by farmers in Pawnee County, Neb.

Severely hummocked field in Dust Bowl. Typical of the problem that challenged joint efforts of scientists and farmers in 1934.

Glimpse of same field, after leveling and planting to mil and sudan grass.

within the State, less than 50 miles away. The district supervisors were discussing conservation practices that had already been tried and prove on the experiment station. In addition, thes same practices had also been applied on severa hundred farms in the large demonstration pro ject which included the experimental area. It i entirely possible that many similar meetings hav been held, in other districts, where occasion ha not been taken to advise the district committee men and the community leaders of important re search findings that might apply to their dis tricts.

The district chairman called on the district con servationist for technical advice concerning sev eral conservation practices. But the conservation ist failed to tell about the conservation wor carried out in neighboring counties. It woul have been appropriate to have pointed out th significance of the results obtained over more tha


The common crooked-type black locust; nothing to brag about.

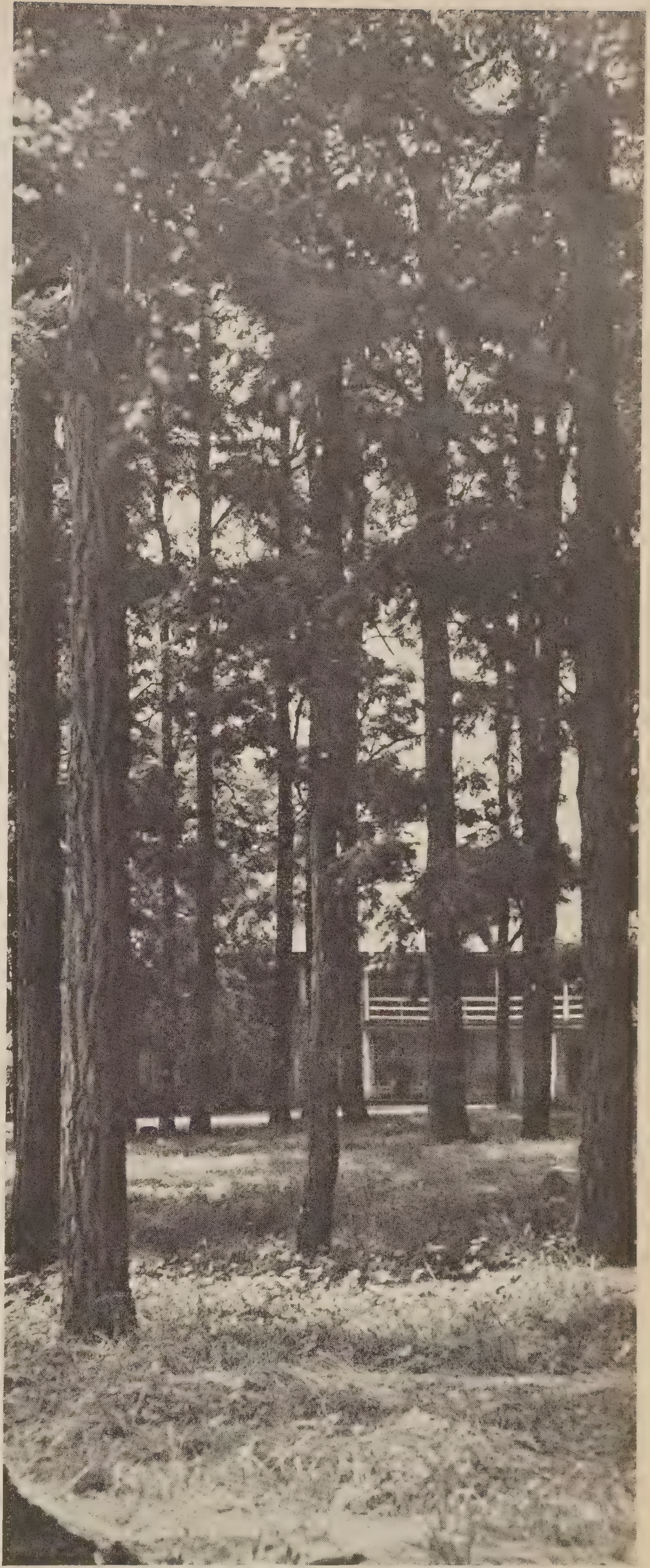
10 years of experimentation and application on farms, and to have suggested the station as a logical place for the next scheduled meeting.

At the subsequent meeting the research project leader would assist the district conservationist in showing district committeemen and community leaders the experimental work at the station. Furthermore, they properly would visit some of the neighboring farms in the demonstration project where many of the mooted conservation practices have been in operation for 8 to 10 years. This would provide a splendid opportunity for committeemen and community leaders to discuss and compare their own problems with those within the demonstration project, and enable them to determine how best to proceed with the district program.

Often, district conservationists will find the answers to many of the problems in their districts spread right out before them on experiment station farms and on farms located in demonstration projects. They should take full advantage of the opportunities nearby, and thereby render a greater service to the district.

Preliminary studies made over a wide area have shown that land capabilities are influenced by depth of topsoil and that crop yields vary inversely with soil depth. These data, when considered in conjunction with relative commodity prices and farm expenses, are very important in determining the best present and future economic use of farm land.

Innumerable are the examples of the results obtained from soil conservation research. Only a few are needed to illustrate their effect on the agriculture of this country.


On the other hand, here we see a specially selected strain of straight shipmast locust of economic importance. It is rapidly replacing its vagabond cousin.

Contour cultivation, little used until a few years ago, is rapidly replacing the practice of farming up and down the hill. The Service records show that 14,171,282 acres of contour planting had been planned on soil conservation projects and districts, and 10,382,516 acres of contouring were actually to be seen by the beginning of this year. The increases in yield run from 3 to 11 bushels per acre for corn and 3 to 6 bushels per acre for soybeans in the Corn Belt. In the Southern Plains contour cultivation has given good increases in the yields of wheat, kaffir corn, and edible beans. Increases have been reported elsewhere for potatoes, vegetables and other crops.

Kudzu, which until recently was used primarily as an ornamental porch vine, is now marching across the critical slopes of the Southeast reclaiming gullied and eroded land and supplying valuable pasturage and hay. This high-powered soil conserving crop has already been planted on 174,195 acres and by the first of this year plans had been made for planting 409,421 acres in the Southeast.

The wild winter pea was just an unnoticed legume of little significance until it was taken hold of, and its worth as a soil conserving crop demonstrated, by K. G. Baker of the Alabama Agricultural Experiment Station. Crotalaria and blue lupine are additional crops that are being used extensively for soil conservation through much of the South.

The crooked black locust, so common to many sections, is being replaced (as a result of our research) by the superior straight shipmast locust which promises more economic return.

Practical ways and means of ridding range lands of mesquite, have been developed and are already being applied to ranches in the plains of Texas. The elimination of undesirable trees from range lands improves the grass very materially.

The development and use of crested wheat grass in the Northern Plains and the use of alfalfa and brome grass in the Corn Belt have contributed much in the way of conservation and in supplying valuable feed. The seeding of alfalfa, in the eastern part of the Corn Belt, on poor pasture or meadow land, without plowing, is quite a departure from the conventional way of seeding. This practice has proved practical in conserving soil and water and insuring high production when the soil is properly limed and fertilized. Application of these findings is being extended to large acreages of farmland in eastern Ohio and is under trial at a number of other locations.

Improved drainage has removed many of the hazards of farming on bottom land and has contributed much to crop production during this war emergency. Similar drainage improvement needs to be applied in many areas not now treated.

The development and use of subsurface tillage equipment for better utilizing crop residues has occupied a very important place in the soil conservation program in the Northern Plains. Much additional investigational work is under way throughout the United States which should ultimately supply the information needed for determining the best crop residue management for each problem area.

Studies conducted in the Dust Bowl furnished information on the practical procedure for stabilizing sand dunes and for getting the many blow areas revegetated.

Many questions admittedly remain unanswered. Practices now in use can and should be improved. It is heartening to have many Federal and State Agencies giving assistance to farmers in this great fight against soil wastage. Through the application of a coordinated soil conservation program valuable soil is being conserved and at the same time increased per acre yields are being secured. It is quite apparent, however, that if research and operations had not worked together in this cooperative approach to soil conservation we would undoubtedly have plowed large acreages of ill adapted land to meet the requirements of this war just as we did during the last war.

Thus, indeed, would soil and water conservation have been out "for the duration." Furthermore, it would have been set back at least another quarter of a century. This reemphasizes the need for close exchange of information and union of effort between the forces of research and those of operations in developing and establishing soil conservation practices. It is imperative that all technical Service personnel be alert to the extensive research under way in the field of conservation and closely related investigations, and that the district governing bodies and the public generally be kept informed concerning the results. By so doing, steps can be taken to modify present research so that it will meet promptly changing conditions, making it possible for the Soil Conservation Service, through organized districts, to render the highest type of service to farmers and ranchers and thereby extend the benefits of soil conservation to the entire Nation

Mixtures of brome and alfalfa are making good for soil conservation in much of the corn belt. This is on a Kansas farm, not an experiment station plot.

Blue grama in Texas — excellent protection against both water and wind erosion.

Something new is being added — weeping love grass, a highly productive grass which protects the land against erosion.

Spuds, too, are beneficiaries of the teamwork of experiment and experience. Contoured Maine potatoes here are being sprayed with specially designed equipment to get at both under and upper sides of leaves. In the background is a neighboring field still clinging to up-and-down cultivation.

Crested wheat grass is rapidly taking vast acreages in the West, backed by sound research and extensive tests under actual farm conditions.

Sweet clover has proved itself a high-powered legume which responds well to treatment and is making good in a big way as a soil conservationist.

1944 OHIO CONFERENCE

Camp Muskingum.

Photographs by Orval E. Sellers, supervisor of visual aids, Board of Education, Akron.

By WELLINGTON BRINK

THE SCENE is Camp Muskingum, nerve center of the famed Muskingum Watershed Conservancy District, where floods are harnessed, and watersheds returned to crops and wildlife and woodland. The year is 1944. The occasion is the third annual conference on conservation, nutrition and human health, held as a part of Ohio's unique Conservation Laboratory for Teachers.

Tar Hollow pioneered the laboratory and the conference. Tar Hollow attracted such popularity that it became necessary to transfer headquarters to the better equipped and more commodious Muskingum.

You have heard about the experiment at Tar Hollow. In October 1942, and again in October 1943, the story was told in the pages of this magazine.

The idea is to provide teachers with a six-weeks combination vacation and Nature-study course. The method and the scope are the unique features. And the extraordinary thing is that it had never been done before. To learn Nature, the teacher-students live with Nature. So do the geologists, biologists, soils scientists and other members of the faculty. In the presence of Nature, latent interests are whetted, dead book knowledge comes to life, life relationships fall into their appointed pattern.

You don't go to Tar Hollow—or Muskingum—to study mineralogy. You don't go there to concentrate on the cell formations of grasses and woody plants. You don't attend for the purpose of acquiring a degree in mammalogy. What you do seek is a coherent understanding of the soil and the life it supports. For once in your life, at least, you put to examination a segment of Man's primeval environment, see what happens when you apply the principle of ecological adjustment. What of Man in his natural world of wind and wave, rock and vegetation, fur and fin and feather? How must he behave in the presence of life's elements if he would have them all his friends and helpers?

It is science, of course. It is indeed a senior science, into which must enter nearly every other major science. The ecology of plants and animals, in many schools of Ohio and in a few schools in other states, is being recognized as a fundamental part of a good curriculum. Small children, and their older brothers and sisters, are finding vitality and fascination in this new science missing heretofore. And the courses themselves, with few exceptions, remain unchanged—it is the philosophy and the teaching that tells. The teacher of eco-

logical mind now talks not merely soils—he talks soils and their conservation. The teacher of botany broadens his subject to point out vitamin and mineral content. The vitamins and minerals, in turn, are coupled with farming methods—and farming methods are linked to the social and economic coloration of the community.

Ohio's state university and conservation forces sponsor the Muskingum outdoor laboratory, provide credits which may be applied for degrees, set a precedent of breaking away from orthodoxy in educational methods.

As a result, there has been more than a ripple among the pedants. Students have come from many parts of Ohio, and from many other States.

The country is taking note. Year by year, the list of leading lecturers and public leaders who gather for a two-day conference on conservation, nutrition and human health becomes more impressive. The conference is a high spot—but only a high spot—in the regular sessions of the school. It is also a high spot, and a growing influence, in the country-wide drive to rationalize the conservation of soil and of the American civilization which rests thereon.

FROM KNOX COUNTY, Ohio, this year came Cosmos D. Blubaugh to tell a story, "How We Rebuilt Our Farm." No advanced degrees go after his name. No gift of gab has he. A slight man, just a little shy, Cosmos Blubaugh was a principal speaker on a program of undoubted distinction. His only title is a common one, and yet it carries uncommon dignity and authority: farmer.

Farmer Blubaugh, whose story was briefed in SOIL CONSERVATION back in May 1940, didn't climb to the center of a platform—but a platform came to him. He spoke quietly, somewhat hesitantly at first, but as he continued to speak the eloquence of simplicity tipped his tongue and the power of great truth lighted his kindly eyes. And when he was through, the beams bracing the roof of Muskingum's great lodge felt the vibration of applause from the audience in the folding chairs and from the expectant, hopeful, larger audience waiting for his message to feel its way across the land.

Farmer Blubaugh bought an erosion-ravaged, worn-out hill farm in 1924. . . . "Men who enjoy the feel of the earth under their feet will know why I wanted to farm." . . . Forty bushels was all that he could get the first year from 15 acres in a field planted to wheat. Half of that belonged to others. There was not enough grass on 140 acres to pasture 3 not-too-hungry cows. . . . "There was absolutely no humus—the soil was low on everything."

But Farmer Blubaugh had an ace or two in the hole. They stemmed from common sense and native shrewdness. He practiced thrift, carefully husbanded every bit of barnyard manure and distributed it on a new seeding of wheat, not for the purpose of growing wheat but to grow grass. From the Extension Service he learned that he should add lime and phosphate to his land. From his bank he obtained the trifling bit of credit needed to prepare a 4-acre field by way of a beginning. From "generous" neighbors he obtained their unused straw and stalks. As a result, Blubaugh obtained the best wheat yield that the land had produced in 20 years, 15 bushels per acre.

But it took Farmer Blubaugh around 10 years to really get going. That was when the Soil Conservation Service came around a bend in the road. It brought a CCC Camp to the neighborhood—husky, intelligent lads under expert supervision, who laid out strips and relocated fences on the Blubaugh place and gave the little extra push needed to get a soil conservation plan under way.

Blubaugh stopped the washing of soil, pinned it down with vegetation. He centered his attention on grass. He left on his field every possible scrap of residue, to protect the oncoming crop—

AN EARTH AT PEACE WITH ITSELF

Fair is the land that rims the Tuscarawas, the Conotton, and the McGuire. Quiet, cool, are the dawdling streams. Green, happy, are the cradling slopes. Gentle is the rule of order and discipline. A canoe slices like a whisper across a shaded pool, and a drinking doe mothers her fawn to the protective cover of the brush. Nature smiles the old-young smile of memory and hope.

Here, where calm waters pile back in a twelve-mile lake from the breast of a man-made dam, a new faith stands to cheer the rising sun. A noble and intelligent faith that moves within a widely-drawn periphery. Here, vigorous and clean as morning dew—and as welcome to the aging throat of civilization—lies upon every leaf and stem a concept of an Earth at peace with itself. Here Science and Youth move in comradeship with that which is on, and of, the soil.

—WELLINGTON BRINK

all straw except for bedding, corn fodder hauled in from the farms of neighbors who were glad to get rid of it. From a big sheller in the neighborhood he hauled 3,000 to 5,000 bushels of corn cobs which would otherwise have gone to waste. Year after year, Farmer Blubaugh "grew grass to feed trees." Year after year he built his soil from "waste" vegetation. Year after year, he pumped nitrogen into his gasping acres with legumes. He found that his alfalfa thrived on a phosphate fertilizer, used no potash. Some of his neighbors thought they needed "complete" fertilizer, but Blubaugh preferred to grow most of his.

Gradually, steadily, the old farm came to life. Gradually, steadily, it changed from an old farm to a new farm. "Grow grass, and you can grow anything," Blubaugh began to say.

But Blubaugh is a successful conservation farmer partly because he is a successful conservation father. He has kept his soils on his farm, and he has also kept his sons on his farm! Those two sons he took into partnership. One of them manages the orchard, one of them the dairy and hybrid seed work. But it is a flexible arrangement which permits either to be gone a week at a stretch, knowing that his brother is entirely competent to carry on. The soil is happy, and so are the sons. They all work together, whistling at their work.

Today, the Blubaughs produce 20 to 40 bushels of wheat per acre, from 85 to 100 bushels of corn, from 3 to 4 tons of alfalfa; the business harvests 8,000 bushels of tree fruits and 2,000 bushels of berries each season. Twenty acres are in hybrid seed corn—800 certified bushels is the yield, at a profit of $5 per bushel. Thirty acres are in feed corn. The pasture takes care of 1 or 2 animal units per acre; in the summer Blubaugh takes his cows off bluegrass and puts them on alfalfa, and he doesn't bother much with adding protein feed. Today, 140 acres are supporting three families and from one to twenty hired helpers. Blubaugh figures every department a moneymaker, keeps careful books, estimates an increase of 5 to 15 bushels per acre in corn yield from the simple fact of leaving the stalks on the field for reincorporation with the soil. He gets 5 to 6 bushels more wheat per acre by cutting with a combine rather than a binder. He knows that the straw definitely increases the growth of grass; it is more lush, and it comes earlier in the spring. He is sold on contour strips 70 to 85 feet in width. He rotates 2 years grain with 2, 3 or even up to 5 years grass. He has 1,085 apple trees, 350 peach trees—all feeding, and thriving, on "unwanted" vegetative matter. And he admits, despite all the current furore which centers in his home State on the subject of plowing, "I use a moldboard plow!"

Some of Farmer Blubaugh's neighbors have been picking up some good tips. (It took them 19 years to start!) As a result, they have lately been tripling grass and grain yields and are beginning to complain, "What shall we do with all this grass?" Blubaugh doesn't worry on that score.

Not only has the soil come back—so has the water. Back in 1924 Blubaugh had three feeble springs. His cows would take the supply at a gulp or two, and then have to wait 8 to 10 hours for another supply. Today the springs are back in full flow.

Blubaugh drilled a well. He used a hand pump at first, and could pump the well dry in 15 minutes. Today an electric centrifugal pump provides 5 gallons a minute, 24 hours a day.

Blubaugh built a dam, sodded the spillway, installed a fence, turned water in on Decoration Day two years ago, now has a spring-fed pond 1¼ acre in surface size, 8 feet deep. To hold down the bluegill population, he has stocked the pond with large-mouth bass which will provide good food and good sport. Next year he plans to fertilize the pond in accord with the best modern practice.

That's all there is to it, says Blubaugh. A simple story, simply told, but one which had the Muskingum conference excitedly asking questions for 30 minutes after Blubaugh arrived at a convenient period.

SPOKE then the brilliant author and economist, Ralph Borsodi. From his own sustenance plot near Suffern, N. Y., he brought a crisply stated "Plan for Rural Life."

Dr. Borsodi is a pessimist, and a dreamer. But his pessimism and his dreams are agile with restless hopes and plans and ideals. And they move with the sincerity of personal experience. He grows his own food, weaves his own cloth, with his wife turns back the years toward the rural self-sufficiency of the pioneering forebears. Behind Cosmos Blubaugh, maintains Dr. Borsodi, is a century of miseducation. And again, "The greatest crops Mr. Blubaugh raised on his farm might not be the crops but the children"—for Dr. Borsodi does not regard farming as a business but as "a way of life."

Ralph Borsodi was born in New York City. He became an expert on marketing, a consultant to big industry. Out of his contacts with hard pavements, out of the groaning of factories, out of the contacts with moneyed business and congested


The land under close scrutiny by a Conservation Laboratory class. Dr. C. L. Dow, teacher.

populations, came fierce revulsion that drove him in determined flight to fields and streams. Here, as he labored to supply his simple living, he took time to think.

From his thinking came the conclusion that it is a mistake to regard this world as containing two kinds of human beings, two kinds of cultures, two kinds of economic conditions. We—they—are all one. Something he reasoned, must be terribly wrong with modern industry, sociology and plans for living.

He recalled the warring philosophies of the founding fathers. "One dream," says he, "is symbolized in the person of Thomas Jefferson, who believed that the only way the new Nation could be built and maintained was as a rural society, who believed that if ever America forgot that, the country was doomed. "The other dream," Borsodi says, "was symbolized in the figure of Alexander Hamilton, who hoped for a manufacturing society, with the rural population feeding cheap raw materials into industry. We have given lip service to Jefferson. We have actually followed Hamilton."

Dr. Borsodi is deep in sorrow, passionate in denunciation. "I believe society is very sick," says he. "I wish I had the eloquence to tell you how sick it is. What is wrong? Why is it we have a society which every ten years or so throws an apoplectic fit which we call a financial crisis? . . .

"We adopted a fundamentally wrong attitude toward the land. What we really used the land for was a gigantic real estate speculation. We purchased it cheap, used it for a time, moved on to cheaper land. We look at it, on the one hand, as 'the holy earth'—and on the other, as a means of making money. Roughly, every 30 years the farmers have had to ship their holdings to the city heirs—the full value of the investment in their farms. . . . Why divide America up into 160-acre blocks, utterly disregarding the topography of Nature? . . . From the very beginning we have assumed that the object of every rural family is to make money. This accounts for cash crops, specialized cropping, the concentration on tobacco, cotton, furs. . . . We have over-mechanized. Every time you double the size of a farm, you push somebody off the land."

Dr. Borsodi foresees another—and better—pattern, which involves the repudiation of all

these things. He foresees a return to small farms—everyone on a plot of ground, and a plot of ground for everyone. He foresees the breaking up of heavy industry and in its place small, decentralized industries manned by workers who have one foot in the soil. He foresees a decline of the dollar motive, and a truer perspective drawn on farming as "a way of life." He suggests that each farm should constitute "a balanced biological unit" similar to that of a Virginia friend of his which supported 35 persons, produced 90 different items.

Replanning of rural communities is indicated, he says. And the least we can do for returning soldiers is to make it easy for every one of them to acquire a piece of the land for which he fought.

The pink glow fomented by the success story of Blubaugh and the utopianism of Borsodi still warmed the rank and file of conferees hours later when a calm logician rose to discuss the building of a permanent agriculture.

THE CALM LOGICIAN was Chester C. Davis. He is as factual as he is friendly. Out of long and intimate knowledge of both farming and business, Chester Davis has learned to accept the broad outlines of the established American social order. Within those outlines he finds room to reconcile disruptive lights and shadows. He views the panel with the open mind of the journalist, the exactitude of the financier, the perspective of the government administrator. Once a distinguished editor, later the courageous and imaginative head of the Agricultural Adjustment Administration, currently the president of the Federal Reserve Bank of St. Louis, Chester Davis is now also president of Friends of the Land—and there is no truer "friend" anywhere.

Mr. Davis hopes for an agriculture not only permanent but also satisfactory both to the farmer and to the whole American family. Frankly, he warns that we are not to realize the agriculture of the perfectionist. "And yet," says he, "always men have dreamed dreams—and sometimes rapidly, sometimes gradually, we see those dreams take hold." As a result, we have waxed great and prosperous, with a National income of around 150 billion dollars a year—and a National debt of 90 billion dollars, to which is being added a billion dollars more each week.

"The question," the speaker bluntly puts it, "is, how well can man master the machinery he has developed?"

Wise counsel: Farm debt has been reduced; farm income increased, and for the most part used intelligently. Agriculture must face serious readjustments after the war . . . Let's keep out of debt . . . Let's hope that farmers will sock every cent they have into war savings bonds and not go on a buying spree for new land. . . . Let's continue to underwrite farm prices during the period of adjustment . . . Avoid basic elements of a land boom . . . Extend grassland, make the conservation of soil and water the basis of farm operations.

Then—a sober word of caution—we shall have to do everything possible to prevent an unwise rush back to the land. "Those who watched after the last war—those of us who know something of the pain and size of the agricultural situation—fear the impact on established farmers if an attempt is made to make agriculture the shock-absorber of the industrial workers who come back."

Chester Davis well knows that leadership and statesmanship will be required. He urges the development of healthy terms of land tenancy, the necessity of keeping the farm income high and working for its wide and careful distribution. He stresses the importance of finding full employment for workers in non-agricultural fields, at good wages, as a requisite to sound rural life. "I would like to see the factories going full blast, turning out useful goods—everything needed on the farms, at the best prices. Do that, and we need not worry about farm prices; they will be somewhere near parity. It is all one problem; many men see this, some of them high in the ranks of industry."

The way to effect a speedy transformation back to peacetime pursuits, if we would heed Chester Davis, involves maximum output, lower unit costs of production, wider distribution of goods, gradually lowering prices, sincerity, good humor, tolerance, cooperation, and organization. A stiff menu, but full of digestible vitamins for a Nation convalescing from war.

FROM WASHINGTON this year came Dr. William R. Van Dersal, to tell of the use and abuse of the American land. Author of the soundest, most complete and most readable book in existence on ornamental shrubs, Dr. Van Dersal has a "green thumb" and a feeling for the soil that comes of working in it with a trowel. But Dr. Van Dersal also has the long perspective that shows in his currently celebrated "The American Land—Its History and Its Uses."

Very artfully Dr. Van Dersal set the stage for the entire sessions. In some 45 minutes he compacted the genesis of agriculture from Adam to AAA. He advanced the theory that "we did not *will* a democracy in the United States; we could not help it!" And again, he reminded us that in the early days of settlement of this country we had to "learn not only how to live with each other but how to live on the land that supports us." After tracing the troubles of the land, he declared, "If American land and the abundance of it induced the development of a democracy, it is of historic significance that democracy may prove to be the salvation of the land. Never before in this country or in any other country has such a coordinated attack been made on the land problems of a Nation. In this respect the United States is far ahead of all other nations with the possible exception of Switzerland . . ."

DR. WILLIAM A. ALBRECHT is a perennial, a fixture of the conference. More than any other man, in all likelihood, he has set the Nation to thinking about nutrition in terms of soils. He is chairman of the Department of Soils, University of Missouri, but his time and energies are claimed increasingly all over the United States, where he lectures in the dual capacity of scientist and evangelist. He said, as always, many striking and memorable things. H. E. Hamlin, supervisor of health and narcotics of the Ohio Department of Education, neatly gathered the gist of Dr. Albrecht's remarks in the following five-point summary: As a Nation we wrongly tend to 1. emphasize economics in contrast to agronomics; 2. rely upon photo-synthesis rather than bio-synthesis; 3. feed upon carbonaceous rather than proteinaceous foods; 4. depend upon "go" foods rather than "grow" foods; 5. go from a temperate people to an intemperate people by a simple act of processing the "go" foods.

ON 1944's PROGRAM, too, were David C. Warner, of the Ohio Department of Public Works; Professor Clyde Jones, of the State University's botany department; Arthur R. Harper, naturalist of the laboratory staff; Dr. Julian D. Boyd, of Children's Hospital, University of Iowa; George Trautman and Don Waters, of Ohio's Division of Conservation and Natural Resources. Each made a valuable contribution to the warp and woof of conference thought.

I should like to present in full the remarks of Ollie E. Fink, who so ably directs the entire school; Dr. Jonathan Forman, who always has a guiding hand in the rigging of the featured conference; Dr. Paul B. Sears, esteemed for his counsel and leadership. But the readers of SOIL CONSERVATION already are well acquainted with the works and writings of this notable conservation team and will, it is hoped, become yet better acquainted as future issues roll off the press.

In touching on the high spots of the conference, it is well to remember that the dormitory debates and the group discussions at meal-time and smoke-time are equally stimulative. The only way to derive the full benefit of the annual conference is to attend; no second-hand report can adequately substitute. My advice to would-be keepers of the soil is to put this annual meeting on the "must" list for next year. For the Tar Hollow—excuse me, the Muskingum—conference is now a regular institution, draped in its own tradition, coloration, and unique appeal.

To the Muskingum outdoor conservation laboratory are being drawn students from many states. They came not only from Ohio this year, but also from Tennessee, Illinois, Connecticut, Indiana, Minnesota, New York, Michigan, and New Hampshire.

BOND PURCHASES SOAR

Nearly 1½ million dollars were invested in war bonds by employees of the Soil Conservation Service from March 1 to August 1—$1,472,605.24, to be exact. This proud total represents payroll allotments plus cash sales during the Fifth War Loan drive.

Within the period of the Fifth War Loan campaign, Service employees attained 121.52 per cent of the assigned quota of purchases.

Cash purchases by Service employees within two months, June and July added up to $395,630.70. Payroll allotments for bond purchases accounted, within these same 60 days, for $418,796.68.

While all of these purchases were voluntary, it is apparent that workers in the agency primarily concerned with the salvation of the soil resource are equally determined to conserve all the other values important to the future of the United States.

John S. Fickling is chairman of the committee which handles war bond purchases in the Service.

The Wadsworth Brothers, a Conservation Team

By BARRINGTON KING

When the three Wadsworth Brothers of Autauga County, Ala., started farming on their own 10 years ago, they didn't start from scratch. They started way over on the minus side of the line, for the farm they inherited from their father was heavily mortgaged, the equipment was in bad condition, the workstock was old, and the land itself was tired.

Like most farmers in that section, their father had always been a cotton farmer. He planted 300 to 400 acres to cotton each year. The time was when a farmer that planted that much cotton could go to the bank and borrow all the money he needed to operate his farm. When cotton prices were high, farmers in the big cotton plantations lived exceedingly well.

But a one-crop system of farming without adequate soil conservation measures had greatly reduced the productive capacity of the land. Cotton yields had consistently declined. It was becoming more and more difficult to meet the farm's obligations. When the depression came and the price of cotton dropped below the cost of production, the outlook was grim indeed.

After the death of their father, the Wadsworth Brothers realized that even to pull the farm out of the red was going to take years of hard work, frugal living, and an improved system of farming that would provide new sources of income. Close cooperation would be needed to put the farm on a business-like basis.

The three brothers started out in 1934 by borrowing $700 to buy a little livestock, equipment, seed, and fertilizer. They began their first year's operations with 11 old mules, 7 or 8 cows, a brood sow or two, and a strong determination to build up the farm to a high state of productivity.

To cut their living expenses to a minimum, they decided to maintain only a single household. The three brothers, their wives and their children all live in the family home with their mother and have a joint account at the bank. They hope eventually to build separate homes, but those can wait until other plans materialize.

To get on an efficient operating basis, they decided to divide the farming operations. Jack, the oldest brother, became general manager, responsible for financing the farm and handling the machinery. Leonard was to look after the labor, with supervision over hoe hands and plowboys, and responsible for production of row crops. Edward was given charge of the livestock.

While each had his special field, they all pooled their efforts during rush seasons at planting and harvest time, or on occasions like the one this spring when the three brothers played midwife to 50 brood sows for three nights during the spring farrowing seasons. But that's getting ahead of the story.

Back in the those early days the Wadsworth's

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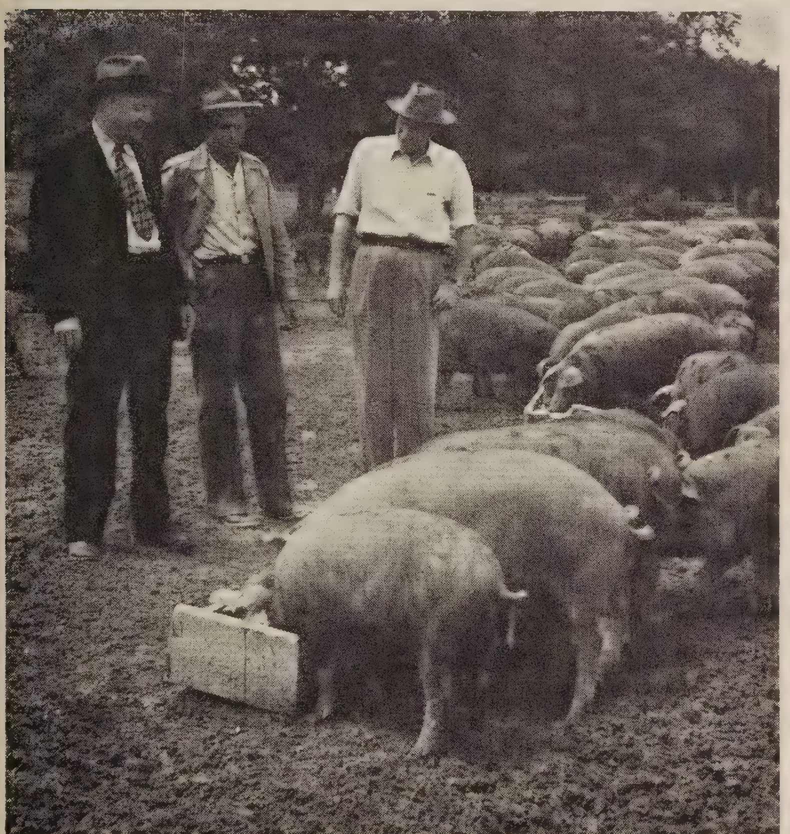
Harvesting seed from 75 acres of first-year white Dutch clover, which provided grazing for 86 cows and their calves from February 15 to May 1, when the cattle were removed to allow the maturing of a seed crop. This picture was made early in June.

Cultivating cotton on the contour on the Wadsworth Brothers farm in the Central Alabama soil conservation district. Cotton acreage has been reduced from the 300 to 400 acres formerly planted, to 100 acres under the conservation program.



Chief Bennett of Soil Conservation Service, Edward Wadsworth, and Novelist Louis Bromfield look over hogs on Wadsworth farm during Friends of the Land tour.

realized that they would have to take advantage of all the help they could get if they were to make a success of their venture. Triple-A assistance went a long way toward enabling them to develop pastures and hay for the increasing numbers of livestock on their farm, and the TVA furnished phosphate for improvement of demonstration pastures. In addition to this material aid, they have consistently obtained information from the Extension Service and other agencies.

When the Central Alabama soil conservation district was organized in 1939, the Wadsworth brothers were among the early cooperators. Through the district, they obtained aid of the Soil Conservation Service in working out a sound land use program that put every acre on the farm to its most effective use. Under the complete soil conservation plan that was developed they made rapid progress toward the accomplishment of their goal of improved soil fertility and livestock farming.

As a part of their conservation program for the 3,000 acres they operate as a farm unit, the Wadsworth Brothers have established 150 acres of kudzu and 50 acres of sericea on their poorest, most erodible land. These areas would not make over 5 to 10 bushels of corn per acre, but they produce good yields of high-quality hay and provide abundant grazing for hogs.

During the past 10 years, the three brothers have developed 500 acres of permanent pasture. About 100 acres of land are prepared each year and fallowed during the summer. This permits taking advantage of favorable moisture conditions for early planting of winter grazing crops.

The Wadsworth brothers carry 40 to 50 brood sows and get two litters of pigs a year, averaging 7 to 8 pigs to the litter. Most of the pigs are farrowed during periods of a week or 10 days in March and October. They are farrowed on crimson clover in the spring and kudzu in the fall, which has largely eliminated the occurrence of diseases and parasites.

The litters farrowed on crimson clover in the spring go to kudzu in the summer and are finished on corn in August. Those farrowed on kudzu in the fall are pastured on oats until about February 1, when they go on crimson clover. They are sold as tops in May and September, averaging around 250 pounds.

Cows are bred for calves to come in the winter. The calves are fed out for baby beef by fall, when they weigh around 500 pounds. Last year the Wadsworth Brothers sold 600 hogs, 200 baby beeves, and 50 grown cattle.

The 700 acres in cultivation include 175 acres of oats, 300 acres of corn, 100 acres of cotton, 50 acres of sorghum for silage, 50 acres of sweet potatoes, and 75 acres of crimson clover for hog grazing. During the winter, 80 percent of the cultivated land is in grain, crimson clover, vetch, or some other winter cover.

As a result of better land use, the planting of winter legumes, and the application of lime and fertilizer, crop yields have been increased materially. Cotton production has been boosted from 300 to 400 pounds per acre, and the yield of oats from 25 to 30 bushels to 50 or 60 bushels per acre. Field selection of seed corn and good farming practices have increased corn yields from 10 to 15 bushels per acre to 40 bushels per acre.

After feeding all workstock, cattle, and poultry last year, the Wadsworth brothers sold 2,000 bushels of oats and 1,000 bushels of corn.

In addition to other crops, they have 70 acres in pecans. The pecan orchard is under a winter cover of wild winter peas.

Approximately half the farm, or about 1,500 acres, is in woods. There is a small sawmill on the farm, and timber is cut for farm building and repairs by selective methods. By following good woodland management practices, an excellent stand of timber is developing. Eventually, the Wadsworths expect to cut the timber for building separate homes from their own woodland.

The three families living together in the same household—an economy adopted through necessity when farming operations were started 10 years ago—has been a factor in the successful operation of the farm. When the men and their wives gather around the same table at mealtime they have an opportunity for planning the various phases of their work together. And farming on the scale of the Wadsworth farm takes a lot of planning.

Something of the extent of the accomplishments on this farm is indicated by the fact that annual sales of beef and pork run around $40,000. Instead of the $700 borrowed to start the first year's operations, the farm's expenses now amount to $15,000 to $20,000 a year for labor, fertilizer, and fuel for farm equipment. But no longer is it necessary to borrow money to operate.

When Raindrops Splash

Moisture in flight! Long, vertical lines are falling raindrops; other flying particles, raindrop splashes.

By W. D. ELLISON

When falling raindrops strike a bare soil, or thin films of water covering it, particles of clay, silt, and sand, and bits of fine gravel and small aggregates may be splashed into the air. Many of the splashes are composed of soil particles surrounded by a film of water. Under intense lighting they appear as rockets describing parabolic curves through the air. Some of the stones and aggregates too large to be splashed by the raindrops are thumped about on the surface in such a way that their motions resemble Mexican jumping beans. This erosional activity may be

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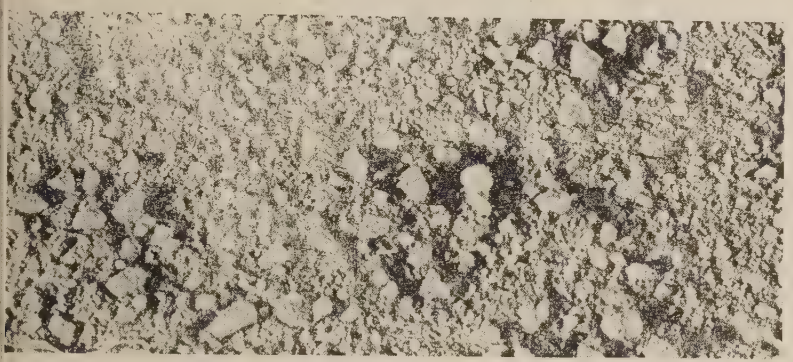
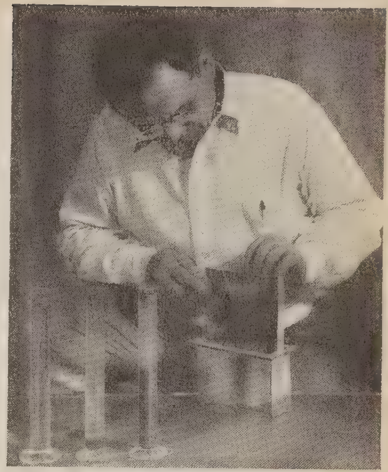
referred to as raindrop erosion or splash erosion. It is accelerated by the formation of a connecting film of water between the clods or aggregates. Surface water a half-inch deep seems to cause more splash erosion than occurs on dry soil.

It is not difficult to imagine what flowing surface water would do while all this soil is in motion. Splashed materials, upon returning to the surface water would be held in temporary suspension by the surface flow and transported some distance down slope before they could settle out. Larger particles which are only tumbled about on the surface would also be placed in temporary suspension immediately following each thump by a raindrop, in which state they could be floated, dragged, or rolled downhill. This is one way in which raindrops and surface flow "team up" to erode and carry soil off the fields. By working together they remove much of the topsoil material from smooth surfaces on the slopes above the rills and gullies which neither surface flow nor raindrop splash acting alone would have the power to carry.

The November, 1939, issue of SOIL CONSERVATION carried some pictures and a short article under the caption "A Camera Stops a Moving Object" by J. Otis Laws. These related to studies



Above, a crumbly soil capable of filtering water at more than 6 inches per hour. No splash erosion occurred when raindrops at zero velocity were released; infiltration continued for one hour; clods and aggregates were not broken down appreciably. Raindrops at a velocity of 10 feet per second, however, caused considerable splash erosion; infiltration rate decreased and was less than one-tenth inch per hour at end of one hour. This one hour of rainfall broke down clods and aggregates and "sealed" the surface as shown below.

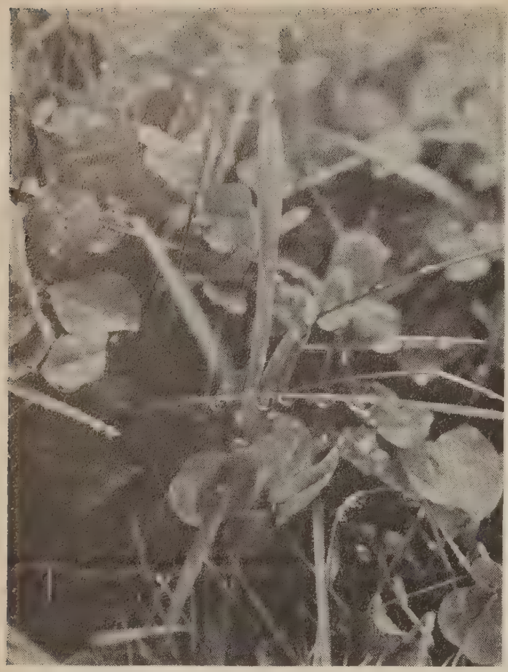


Water and soil in the three tubes represent, from left to right, samples of raindrop splash we may expect from fields where soil is well protected, where it is partially protected by growing crops, and where it is utterly bare. The author is scraping soil from a splash plate.

of raindrops. Following publication of this article and several of Mr. Laws' technical reports, various experiments were started at Coshocton, Ohio, which used Mr. Laws' results to determine raindrop velocities. The objective of the Coshocton work was to study the effects of different raindrop velocities, drop sizes, and rainfall intensities on the splash erosion described above.

We may think of erosion as embracing two distinct processes: (1) displacing or tearing the soil loose, and (2) transporting the soil materials. Through these processes soils may be carried entirely off of a watershed, or they may only be shifted about over the surface in processes of erosional activity. If soils are carried from the watershed, a certain amount of soil loss can be measured but this will not necessarily be proportional to the sum of all erosional damages. Damages caused by splash erosion and which are in addition to soil loss, include development of "spotty" fields through burying topsoil under subsoil, carrying topsoil away from spots where it is already thin and depositing it where the soil is already thick, and destroying soil structure. On soil surfaces outside of the gullies and channels, these damages are dependent on splash erosion.

Although greatest amounts of erosion may be expected where raindrops and surface flow work together, either the raindrops or the surface flow acting alone may displace soil and transport it down slope. The raindrops cause soil to be transported through splash processes, while surface flow carries it in suspension or drags or rolls it along the surface. Erosion scars left at points where the soil is displaced by these two forces usually differ. Raindrop splash usually displaces "sheets" of soil, while displacement by surface flow usually forms rills which later develop into larger channels or gullies. These facts lead one to believe that control of splash erosion will prevent most of the erosional damages outside the rills and gullies, while control of surface flow will prevent damages within the rills and gullies.



Soil under these two cover crops will not be greatly damaged by splash erosion. Coshocton's experimental results suggest that low-growing plants are much more effective than tall plants such as corn, in checking splash erosion. The splash erosion caused by drips from leaves of plants increases greatly with each minor increase in height of plants.

To reduce raindrop erosion one must check velocity at which raindrops are delivered to the soil surface and this may be done with leaf canopies of cover crops and with mulches. To control gully erosion one may use flow diversions which reduce or direct and control the surface velocities. Stems of growing plants and other obstructions which impede surface flow may also be effective. It is possible to have effective control of flowing surface water and at the same time suffer high rates of raindrop splash. And, it is possible to have effective control of raindrop splash while at the same time suffering considerable gully erosion.

The different conservation farming practices used on the fields may have quite different effects on soil erosion. In our analysis of these practices we must consider their effects on both the forces causing erosion, and the erodibility of the soil. For example, leaf canopies of the growing crops and mulches tend to reduce only the forces causing splash erosion, while impediments to surface flow tend to reduce only the forces of runoff. And when it comes to the erodibility of the soil, those practices which develop stable clods and aggregates and which best develop and maintain extensive root systems to resist soil displacement are most effective in binding the soil and strengthening its resistance to erosive forces.

In the Coshocton experiments the splash erosion caused by raindrops was sampled by using splash interceptors which were described in the February, 1944, issue of *Agricultural Engineering*. The soil caught by these samplers was weighed and aggregate and particle size determinations were made. The rainfall applicator used was described in the June, 1944, issue of *Agricultural Engineering*. With this apparatus it was possible to control drop size, drop velocity, and rainfall intensity, and to vary these factors one at a time. They were controlled as independent variables throughout a series of planned experiments and the effects of each on splash erosion were studied. Results of these studies were reported in the April and May, 1944, issues of *Agricultural Engineering*. The best relationship for expressing effects of the rainfall variables on quantities of soil carried by the splash was found to be,

$$E=0.00007661\ V^{4.33}\ d^{1.07}\ I^{.65}$$ where

E=total grams of soil intercepted by the samplers during a 30-minute period of rainfall,

V=velocity of raindrops in ft. per second,

d=diameter of raindrops in mm., and

I=intensity of rainfall in inches per hour.

No rills or gullies were developed on these experimental plots and it was evident that little or no tearing loose of the soil was caused by the surface flow. The principal work done by the flow was in carrying off the materials torn loose and splashed into suspension by the raindrops. Under these conditions there was close correspondence between the curves showing rates of raindrop erosion and those showing rates of soil loss carried by the runoff.

It was previously stated that the splash of raindrops, in addition to charging the surface water with soil materials, may also transport soil downhill. On a plot of 10 percent slope the samples collected from 59 experiments showed that 3.1 times more soil was moved down slope

than was moved up. Did you ever see a stick of dynamite explode on a hillside? Most of the debris thrown into the air moves in downhill directions and that which is thrown down slope travels greater horizontal distances than the material thrown up slope. Raindrop "explosions" work in a similar way and by resplashing the soil many times considerable soil may be moved down slope. Results of this action may be especially noticeable on convex slopes where the splash moving in three or four quadrants is traveling downhill. Wind may increase the transportation capacity of the splash by increasing velocities of raindrops, by changing the angle of the incidence, and by carrying the splash along the surface as it would carry drifting snow.

It would be interesting to know how much soil may be displaced by raindrops. The work at Coshocton did not provide a positive answer, but one may make an estimate. The photographs show that 8.25 inches of artificial rainfall caused about 1 inch of soil to be eroded and splashed away. To carry this thought further, 1 inch of this artificial rainfall would displace approximately 0.12 inch of soil. The drop velocities which caused the erosion shown in the photographs were only about 19 feet per second. If the formula showing velocity relationships is reasonably accurate (it was not tested for velocities greater than 19.2 feet per second), velocities of about 35 feet per second would increase the erosive action by about 10 times. *This would indicate that in a similar storm, but with drop velocities of about 35 feet per second, 1 inch of rainfall may splash about 170 tons of soil per acre.* One should not infer from this estimate that raindrop erosion may cause 170 tons of soil to be lost from each acre of land. The soil loss would depend on how many times soil materials are re-splashed before being carried away. On gentle slopes where there is very little transportation either by the splash or by the surface flow, some of the soil may be re-splashed many times before being carried off the watershed. Under these conditions the 170 tons lifted by the splash may represent less than 10 tons of soil re-splashed many times.

Aside from the many damages which may result from raindrop splash which displaces and shifts the surface soils, the impact of raindrops will destroy soil structure through two separate actions. These actions include: (1) breaking down of clods and soil aggregates, and (2) "muddying" of the surface water preceding infiltration. Pores through the surface soil are partially closed by breaking down the aggregates and clods, and deposits of fine particles from muddy surface water which infiltrates cause further reductions in the size of pores.

Some studies of aggregate breakdown were made at Coshocton. In these experiments four separate types of samples were analyzed. These included, (1) samples of surface soil preceding rainfall, (2) samples of soil carried by raindrop splash, (3) samples of soil carried by the runoff, and (4) samples of surface soil after rainfall and runoff had ceased. Each of the three latter samples contained higher percentages of small aggregates than did the surface soil preceding rainfall, and this was accepted as proof that the soil aggregate did break down under rainfall impact. How much of this breakdown was caused by the impact of the raindrops, and by the grinding process as the aggregates were being splashed about, and how much was caused by slacking remains an open question.

Since splash erosion causes so many damages such as soil loss above the channels and gullies, development of "spotty" soils, deterioration of soil structure, and reduction of infiltration, it is believed that measures of the rates of splash will have broad application to field problems. For presenting some of the practical aspects of such data, the principal factors affecting splash erosion in open fields will be divided into four primary groups: These include, (1) characteristics of the soil, (2) characteristics of soil covers such as growing crops and mulches, (3) characteristics of the slope, and (4) characteristics of the storm. A brief review of each is presented separately.

1. *Soil characteristics.*— Some soils are more stable under rainfall than others. The more stable soils do not suffer as much splash erosion as do the less stable ones. A measure of soil splash is important because the splash processes accelerate soil loss and other erosional damages, and they cause the surface to be "sealed" against infiltration. Splash erosion data on the different fields should be helpful in classifying soils according to their stability under rainfall. Or, to state the matter in other words, splash erosion data will be useful for identifying outstanding soil characteristics which are found in those soils most highly resistant to erosion. Such data should also have immediate application in making land-use plans. For example, a soil that suffers high rates of splash erosion should not be plowed clean as often as a more stable soil, one not so easily damaged by raindrops,

even though it be on lesser slope than the more stable soil. This has been recognized for sometime, but we have not known how much splash erosion occurred on the different fields. Eventually many of the soil characteristics which affect splash erosion may be evaluated, but pending completion of such research studies some useful data could probably be obtained by installing splash samplers on the different soils.

2. *Characteristics of soil covers.*—Leaves of cover crops and mulches which protect the soils against raindrop impact have a pronounced effect in preventing erosion. They do this primarily through preventing raindrop impact and splash on the soil surface. Splash interceptors set in different crops and where different residue disposal practices are employed would afford a means of evaluating these effects of the soil covers.

   Some cover crops may be even more effective than mulches which are composed only of the residues of plants grown on the area. Data relating to the effects of these different cover crops and mulches which reduce splash erosion should be of immediate use to those charged with responsibility for making land-use plans.

3. *Slope characteristics.*—While the gross slope of a hillside has an effect on raindrop erosion, it is believed its over-all effects can be modified considerably by tillage practices. Ridges, clods, and other surface irregularities will delay the formation of a connecting film of water which covers the entire soil surface. Since a connecting film of water increases raindrop erosion, any delay in its formation would curtail the splash erosion, especially for storms of low intensity or short duration. Samples of splash from fields where different tillage practices are used should be very helpful in evaluating effects of the surface conditions as developed and maintained by these practices.

4. *Storm characteristics.*—Since the variables of raindrop size and velocity have such great influence on erosion, it seems that development of methods for measuring size and velocity of raindrops will be of material aid in our studies of the effects of land-use practices on erosion and runoff. Such measurements should be particularly useful in comparing the effects of one storm with another.

In conclusion, it may be said that studies of splash erosion should not be considered as a substitute for measuring soil loss. Rather, it offers a means of making more detailed analysis of soil loss data. For example, large amounts of soil loss from a watershed may be caused by high rates of raindrop erosion, high rates of rill and gully erosion, or by both. Gully erosion causes more different types of damages than does raindrop erosion, and the corrective measures required to control a gully may be different from those required to control the raindrop splash. Splash erosion will cause topsoil to be displaced on the entire surface of a hillside, while flow in gullies and rills does not erode the soil surface outside these channels.

In addition to producing different types of erosion damages, each type of erosion will have different effects on the hydrology of the land. Gully erosion may have very little effect on infiltration outside the gullies, while splash erosion may seal the soil surface and retard infiltration rates on the entire field. Because of these and other reasons, I believe that studies of splash erosion will help in the analysis of much of the experimental watershed data we now have on hand or are now obtaining. If it does this, then it may be assumed that it will also be useful to those planning the land-use practices for soil and water conservation and for the control of floods.

Harvesting Seed of Barbados Sourgrass

By FRANKLIN M. GLOVER, JR.

Increased production of milk and meat to bolster the home food supply on the Island of St. Croix in the Virgin Islands group may result from the development by the Soil Conservation Service of equipment for harvesting seed of Barbados sourgrass, the most productive pasture grass on the island.

The grass is especially valuable as a pasture plant because of its ability to withstand extreme drought conditions which occur on the island virtually every year. Until recently, all propagation of this grass has been by stool planting, which is too expensive for general pasture improvement, and by natural spreading.

It was the general opinion of ranchers on the island that Barbados sourgrass could not be pro-

EDITOR'S NOTE.—The author is work group conservationist, Soil Conservation Service, Christiansted, St. Croix, Virgin Islands.

pagated by seed, but the Soil Conservation Service gathered a small amount of seed by hand labor to demonstrate propagation by this method. The demonstration plots were so successful, that a mechanical means of harvesting the seed was sought.

A combine or all-crop harvester was not adapted to harvesting this seed because of the long awns attached to the lemmas and the weight of the seed. An attachment for a mowing machine owned by the Service was finally designed and constructed, and is now being successfully used in harvesting the seed.

As of June 30, 1944, a total of 1,230 pounds of seed had been harvested from seed patches on cooperators' farms totaling 21.5 acres. At a seeding rate of 5 pounds per acre, this would plant 246 acres. Cost of harvesting the seed was 42 cents a pound. In each case the farmer was allotted enough seed to complete pasture improvement provided for under his cooperative agreement, and the remainder of the seed was reserved by the Service for planting on other farms.

The Service will use its own labor and equipment to establish a maximum 5-acre seed patch on any farm and agrees to harvest for the farmer enough seed from each patch to complete his pasture planting, with the farmer furnishing tractor fuel. Where the farmer agrees to do his own preparation and seeding, the Service will furnish seed for planting a maximum of 25 acres, and provide equipment for harvesting the seed as in the other instance.

MUSKRATS PAY FOR DIKE

Selective service for every acre means something on the W. C. Hinkle farm near Worland, Wyo. The seepy bottoms of the Big Horn River are not always suitable for cultivated crop production, but nevertheless can be turned into an economic asset when managed for wildlife crops. On the advice of Service technicians Mr. Hinkle put up an earth levee to stabilize the water level on a piece of marshy ground. Cattails and triangular rushes soon increased. Two years after the dike was constructed Mr. Hinkle was able to trap 75 muskrats on the few acres thus inundated.

BEAVERS BROUGHT BACK

Hay fields subirrigated by the waters of beaver ponds are becoming a more frequent sight in Wyoming. Streams which for many years had been barren of this wild animal engineer, and which as a consequence disappeared during dry spells and furiously discharged their silt-laden torrent during wet, now have returned to a condition approximating that which the first trappers found in Wyoming about 115 years ago. Lush meadows and stable streams are an asset obtained by the livestock producer by stocking beaver on his watercourses. The Wyoming Fish and Game Department and the Soil Conservation Service are helping farmers and ranchers in soil conservation districts to restore beavers to their old-time haunts.

REVIEWS

PRACTICAL FARMING FOR THE SOUTH, By Benjamin F. Bullock. The University of North Carolina Press, Chapel Hill, 1944. 510 pp. $2.50

The author believes that the production of an adequate and varied food supply is a fundamental problem of southern agriculture, and he is doing something about it. In this book he presents useful information on almost every aspect of ordinary crop production in the South. Starting with a brief discussion of types of soils and tillage, the first part of the book—on plant production—progresses through considerations of plant growth and reproduction, propagation, and improvement. Thus, a foundation is set upon which follows first a consideration of the home garden, with suggestions on what to grow and how to plant it, the tools needed, and the control of various insects and diseases. Then the home orchard is treated, naming varieties to grow, how to set out and fertilize the trees, the care of them, and the harvesting and storing of the fruit. There is a long chapter on field crops in which is discussed how to raise corn, wheat, alfalfa, cotton, peanuts, tobacco and many other crop plants. The farm woodlot gets a chapter, and another is devoted to a discussion of the rural home and its surroundings, with suggestions about how to handle water supply, sanitary conditions, electricity, and landscaping. Somewhat out of place at the end of this part of the book, but none the less valuable, is a brief section on the farm fishpond.

The second part —on animal production—starts with a chapter on feeding and care, followed by another on improving farm animals. There are chapters devoted to milk, pork, and poultry production, and one which describes the raising of honeybees. The final part of the book tells of farmers' cooperatives and types of credit available to small farmers. In conclusion, there is a replete list of books and government publications on a great variety of farming subjects. Preceding the index is a "Note on Plowing," added when the book was in press, which gives good statements of both the pros and cons of moldboard plowing, a subject at present much in the public eye.

The book is well named, for it is in fact a practical handbook, and, for all of its 510 pages, is easy to handle, being not more than an inch thick. It is well illustrated by carefully selected photographs. A good job of book making, it shows the care with which both author and publisher have gone into their subject. Some may say that there is little in the book not already available in state and federal publications, most of which are free or available at very small cost. Be that as it may, the author has chosen from all of them what he believes to be most useful to practicing farmers and has brought his choice neatly between the covers of a single volume.

(*Continued on page 64*)

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SOIL CONSERVATION SERVICE

Biographical Sketch of Dr. H. H. Bennett. Soil Conservation Service. mm.
Conquest of the Land Through Seven Thousand Years. Soil Conservation Service. July 1944.
Forestry in Soil and Moisture Conservation. Prepared for Latin American Trainees. Soil Conservation Service. May 1943. Processed.
Range Conservation Glossary. (Prepared solely for use within the Soil Conservation Service.) Soil Conservation Service. June 1944. Processed.
Report on the Reconnaissance Sedimentation Surveys of Loch Raven and Prettyboy Reservoirs, Baltimore, Maryland. Special Report No. 5. Soil Conservation Service. December 1943, Reprinted July 1944. Processed.

OFFICE OF INFORMATION
U. S. DEPARTMENT OF AGRICULTURE

Financial Aspects of Selective Cutting in the Management of Second-Growth Pine-Hardwood Forests West of the Mississippi River. Technical Bulletin No. 861. Southern Forest Experiment Station, U. S. Forest Service. June 1944. 20¢.[1]
Guayule: A list of References. Library List No. 10. U. S. Department of Agriculture Library. Revised July 1944. mm.
A Guide to Better Management: Save Manpower, Simplify Procedures, Save Materials, Expedite Operations, Improve Organization, Reduce Costs. U. S. Department of Agriculture. May 1944. Processed.
Kobe: A Superior Lespedeza. Leaflet No. 240. Bureau of Plant Industry, Soils, and Agricultural Engineering, Agricultural Research Administration. July 1944. 5¢.[1]
Physical Land Conditions in Polk County, Georgia. Physsical Land Survey No. 34. Soil Conservation Service. 1944. 20¢.[1]

STATE BULLETINS

Emerald Sweetclover. Progress Report 896. Agricultural Experiment Station, Texas A. & M. College, College Station, Texas. June 1944.
Forest Management for the Eastern Part of the Upper Peninsula of Michigan. Circular Bulletin No. 190. Agricultural Experiment Station, Michigan State College, East Lansing, Mich. May 1944.
Growing "Manure" with Blue Lupines in Florida. Circular No. 79. Agricultural Extension Service, Gainesville, Florida. June 1944.
Land Utilization and Agricultural Adjustment in Edgefield County, South Carolina. Bulletin No. 349. Agricultural Experiment Station, Clemson Agricultural College, Clemson, S. C., with the cooperation of the Bureau of Agricultural Economics, U. S. Department of Agriculture. June 1944.
A New Era in Oat Production. Circular No. 296. Agricultural Experiment Station, Purdue University, Lafayette, Indiana. June 1944.
Nitrogen Fertilization of Summer Grass Pastures. Press Bulletin No. 535. Agricultural Experiment Station, Experiment, Georgia. June 1944.
Oats on Florida Farms: Grow 50 Bushels to the Acre. Circular No. 78 (Revision of Circular No. 72). Agricultural Extension Service, Gainesville, Florida. June 1944.
The Quarterly Bulletin. Volume 26, Number 4. Agricultural Experiment Station, Michigan State College, East Lansing, Mich. May 1944.
Science for the Farmer. Supplement No. 3 to Bulletin No. 446, the 56th Annual Report. Agricultural Experiment Station, Pennsylvania State College, State College, Pa. June 1944.
Seed Inspection. Bulletin No. 119. Agricultural Experiment Station, Massachusetts State College, Amherst, Mass. November 1943.
Smooth Bromegrass Seed Production in Michigan. Circular Bulletin No. 192. Agricultural Experiment Station, Michigan State College, East Lansing, Mich. June 1944.
Soil Building and Pasture Practices for Alaska. Circular No. 4. Agricultural Experiment Station, University of Alaska, College, Alaska. April 1944.
Soil Conservation in California: Part I—20 Questions and Answers, Part II—12 Definitions. California Conservation Council, Santa Barbara, Calif.
Soil Fertilizers: Their Application and Function on Soils in Alaska. Circular No. 5. Agricultural Experiment Station, University of Alaska, College, Alaska. April 1944.
Types and Distribution of Microorganisms in Some Florida Soils. Bulletin No. 396. Agricultural Experiment Station, University of Florida, Gainesville, Fla. January 1944.
Weeping Lovegrass in Oklahoma. Bulletin No. 281. Agricultural Experiment Station, Oklahoma A. & M. College, Stillwater, Okla., with the cooperation of the Soil Conservation Service, U. S. Department of Agriculture. June 1944.

[1] From Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.

(*Continued from page* 63)

Figure 66 looks to me to be up-side-down, but that isn't of too great consequence in a picture showing fire blight of pears. In view of the attention given to home gardens, beekeeping, farm fishponds and landscaping the home surroundings, it is surprising that attention was not given to the wildlife that farms can produce. Quail and doves, squirrels and cottontails, muskrats and opossums provide sport, food, and income for many farm families, and many acres of farm lands are most productively used when managed for yields of such wild creatures. The only mention of wildlife is an indefinite one in the legend to Figure 14, and recognition of the value of birds as insect eaters.

To the soil conservationist the book is of interest because of the effective way in which soil saving methods and practices are incorporated along with other considerations of good farming. For example, in the first chapter on soils and soil fertility, both text and illustrations give attention to rotation, cover crops, strip cropping, and other soil conservation measures thought to be essential to sound land use. Near the end of the book it is interesting to find that soil conservation is considered important as a means of protecting credit, and in support of soil conservation the author states that "the short time interest of the individual farmer must become synonymous with the long time interest of the nation as a whole."

Although works on agriculture are legion, the fact remains that, in this broad field, there are few general handbooks of practical value, such as this book appears to me to be. If I were a southern farmer I would have "Practical Farming for the South" within easy reach, and I think it would not be long before my copy would be worn and fingermarked from use.

Edward H. Graham

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SOIL CONSERVATION

OFFICIAL ORGAN OF THE SOIL CONSERVATION SERVICE

ITED STATES DEPARTMENT OF AGRICULTURE, WASHINGTON, D. C

SOIL CONSERVATION

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SECRETARY OF AGRICULTURE · WAR FOOD ADMINISTRATOR · CHIEF, SOIL CONSERVATION SERVICE

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WELLINGTON BRINK EDITOR

CONTENTS

Front Cover: Fall plowing on contour in Allen County, Kan. Photograph by Hufnagle.

SOIL CONSERVATION *is issued monthly by* SOIL CONSERVATION SERVICE of the United States Department of Agriculture, Washington, D. C. The matter contained herein is published by direction of the Secretary of Agriculture as administrative information required for proper transaction of the public business, with the approval of the Director of the Budget. SOIL CONSERVATION seeks to supply to workers of the Department of Agriculture engaged in soil conservation activities, information of special help to them in the performance of their duties. Copies may be obtained from the Superintendent of Documents, Government Printing Office, Washington 25, D. C., 10 cents a copy, or by subscription at the rate of $1.00 per year, domestic; $1.50 per year, foreign. Postage stamps, will not be accepted in payment.

From poverty grass to alfalfa

. . . the first farm. Intelligent planning and hard work wrought a transformation.

By C. M. HARSH

In 1934 young Frank Hothem bought a tired hill farm. The land was typical of the thousands of acres of worn, eroded Coshocton county, Ohio, uplands surrounding it. It produced 35 bushel corn, ton-to-the-acre timothy hay, and a-cow-to-five-acres pasture. By 1943 these yields had jumped to 70 bushels of corn per acre, 2 to 3 tons of alfalfa-grass hay, and pastures which would support a husky Holstein per acre in May and June.

Then, in the winter of 1943-44, Frank Hothem sold his productive 114 acres and bought another farm—the poorest farm in the township, according to many of his neighbors.

That takes guts, ambition, a plan—and faith. Frank Hothem has all four.

Let us look at his first farm to find out how he brought up the yields and battened down the soil.

Frank Hothem bought his first farm in the midst of the depression. Although he was born and raised on a hill farm of Coshocton county, Frank had worked in town for six years. His return to the land was marked by one of the worst droughts this section has ever experienced. This was not an encouraging start for a young couple married scarcely more than a year. But the Hothems were determined to make their farm pay.

In those days, when the Soil Conservation Service was still known as the Soil Erosion Service in the Department of Interior, Frank Hothem was one of the many thousands of farmers who realized that they must do something about soil erosion. He had the practical vision to know that every rain, which had been so desperately needed the year before, was now carrying away valuable topsoil and the precious lime and fertilizer earned by long hours of work and quarts of sweat.

On his own initiative, Frank Hothem began field stripping his cropland. They were not the efficient contour strips as we know them today, but they were a definite step in the right direction and they did save some soil. He did not stop here, however. He improved the quality of his

Editor's Note.—The author wrote this article as work unit leader. Coshocton County Soil Conservation District, Coshocton, Ohio, just before leaving for service in the U. S. Navy.

. . . the man, and the three young Hothems.

meadows with lime and fertilizer and sweetened the mixture with alfalfa. On the pastures, Frank got busy with the mowing machine; and also put on as much lime as he could afford. Nor did he neglect the idle land, for some of the Scotch and red pine trees he planted in 1935 now stand more than 15 feet tall. In the meantime, Frank began building up a herd of Holsteins. Mrs. Hothem, who was now the mother of a son, Neal, somehow managed to raise a large flock of White Rock hens and care for an excellent garden. The Hothems also improved the dairy barn, installed a water system in the house and other buildings, built fences, and gradually put a new face on the entire farm.

It was slow, hard work, but there were results. The crop yields were going up slowly, the pastures were gradually responding to treatment, but Frank Hothem was not satisfied. Progress was too slow. His new plan for rebuilding this farm was good, as far as it went. He realized something was missing. Frank Hothem set out to find the answer.

His first stops were at some of his neighbors' farms. For, in the meantime, they, too, had become concerned about their soil losses, their drop in yields and their lowered income. Like Frank, a few of them such as Simon and Paul Scheetz, Alton and Ralph Lautenschlager, and Paul Foster were doing something about it. They were cooperating with what was popularly known as the Coshocton Research Project—a hydrological experimental station and watershed which is pioneering research of the raindrop and all of its influences. It was at these farms Frank Hothem found his answer.

He saw the excellent results of such practices as strip cropping on the contour, diversion terraces, wholesale pasture improvement, and all the other soil-saving, yield-building practices as they were installed on the advice of the technicians of the Soil Conservation Service. It was as though the tired land had received a life-giving transfusion.

Perhaps Frank Hothem went home and tried to visualize such a plan as applied to his own farm. When he was convinced that this new system of round farming for round country was sound, he made his decision, drew up his program.

Briefly, this is the plan he applied to his farm, made with the assistance of H. W. Black, soil conservationist, Coshocton Research Station.

On the cropland, the strips were changed from straight lines to curved ones that followed the contour. A diversion terrace was installed to break up a long watershed. With the assistance of CCC labor, the straight fences were ripped out and contour fences constructed. A four-year rotation of corn, small grain, and two years of alfalfa-grass meadow was adopted, with the amounts of lime and fertilizer applied during the rotations doubled.

On the permanent pasture lands, Frank's program of applying lime and fertilizer was not changed, merely intensified.

More than 6,000 additional trees were planted and protected. The established woodland was fenced off from livestock.

Several tons of additional limestone helped Frank get his soil conservation program into operation rapidly.

None of these changes could be considered radical, for he had already operated his farm on a sound basis. But these changes, simple as they were, combined with his general all-around, good farming practices, brought results. His yields, and the value of his land, spurted.

Frank Hothem was thoroughly sold on his farm plan. In an interview with local reporters in 1942, he said, "I started this conservation program in the spring of 1938, and I would say that it required less work than the old style farming. It takes less horsepower and the machinery problem has not changed. By using the same machinery and putting in the same amount of labor there is no question but that there would be an increase in the amount of crop production. Taking into consideration all crops, I would say that I

have increased my production at least 25 per cent."

Continuing the interview, the reporter asked, "Is your farm going to be worth any more to the country now in this Food for Freedom program because of your conservation farm plan?"

Frank replied, "The trouble in the last war was that erosion took such a heavy toll on so much land because everyone tried to get high production, and they farmed the land in a way that was wasteful of the soil. The change in our practices will do much to control this erosion and we are going to be able to get increased production without wasting soil and destroying the land. Then, when the war is over our farms will have produced more and they will be in fine shape. If another slump comes, we will be in a better position to go through it with our good land than farmers were, following the last war, after their soil was badly depleted. In my mind, there is no doubt that we are meeting increased production and still protecting our lands."

Last winter Frank sold his farm. Ten years of hard work went with the land, which was purchased by a relative, Edwin Hothem, a good conservation farmer himself. The farm will continue to improve under the skillful hands of its new owner.

Why Frank Hothem sold his farm does not matter. Perhaps he took away a small profit in addition to the equity he had built up, but his real profit was a lot of know-how.

Frank wasn't through farming. He considered buying a high-producing, expensive river bottom farm. Finally, when the blue chips were down, he chose another hill farm.

No doubt there was plenty of eyebrow-lifting and head-shaking over the farm he selected. It had been virtually abandoned for 10 years. Briars and sumac sprouts over-ran the pastures, the crop fields were choked with hip-high weeds, the fences sagged, and the buildings needed repairs.

Frank Hothem looked beyond the weeds, the briars, and the sagging fences. The farm laid well. Predominently gently rolling slopes, only a small portion of the land was too steep for cropland, and that was protected by a thrifty stand of young timber. The buildings were located conveniently; the farm was split by a good road. Before he made up his mind Frank went a step further, a step many prospective buyers had failed to take. He dug down. He found from four to six inches of topsoil remaining. That was what he bought—160 acres of it.

His first step following the purchase of the farm was to consult County Agent G. H. Chambers. His next move was to call at the offices of the Coshocton county Soil Conservation District. Although the district was scarcely more than a year and a half old, more than 160 farmers were already cooperating, which is indicative of the progressive attitude of Frank Hothem's neighbors.

In requesting technical assistance from the district, he said, "I want a soil conservation program on my new farm based on the same identical principles as my other plan."

W. S. Donaldson, district technician, collected the aerial photographs of the farm and called on Frank. This is the farm plan they worked out together:

Fifty-four acres were selected for cropland. A 4-year, 2-unit system was planned. Of course, all of the cropland was laid out in contour strips. In one unit, the alternate strips were planned for corn the first year. In the other unit, a small grain crop was planted and seeded in new mea-

. . . the second farm. A rebuilding program lies ahead.

dow. Some of the idle strips were put to use by seeding them with an emergency hay crop. Others were established in trash-mulch (site preparation by disking rather than plowing) seeding of alfalfa-grass meadows. The fertility program calls for a minimum of 3 tons of agricultural ground limestone and 600 pounds of complete fertilizer per acre for each complete rotation.

Seventy-four acres were set aside for permanent and supplemental legume pasture. A treatment program, which embodies generous and repeated applications of lime and fertilizer, and frequent use of the mowing machine, was agreed on. The ratio of summer legume pasture to permanent bluegrass was approximately one to two.

Livestock was excluded from 30 acres of young woodlands, a portion of which was improved with the addition of 1,000 seedlings.

The remainder of the farm was set aside for buildings, a garden plot, and feeding lots.

Although it was early March, this year, before the Frank Hothems moved onto their new farm, they have made excellent progress in 5 short months. They have concreted the barn and installed stanchions to make it available to the dairy herd. They have built a new chicken house. A water system has been added to the house and barn. The trash-mulch seedings of alfalfa look grand. The corn and oats hold prospects of a good harvest. The mowing machine has been busy in the pasture fields, and applications of lime and fertilizer have already been made. New fences are going up.

Frank and his dark-haired, pretty wife now the mother of three, are pretty sure to succeed in their new undertaking, for they know what it takes to bring the land back.

Frank Hothem has proved that the gap between poverty grass and alfalfa is not so wide as some think. It is generally considered a lifetime task to rebuild one farm, almost impossible to rebuild two farms profitably. Frank is exploding that theory.

We need more Frank Hothems.

STUBBLE MULCHING WITH ASPARAGUS TOPS

Dan F. Beegle's asparagus shredder. Dormant tops are cut and spread on the field. Observe the horizontal and vertical cutting bars, and the elevator arrangement for conveying plant material into the silage cutter. Neil Anderson, on tractor, and Virgil Masters, on shredder, perform on Gerber Brothers ranch.

By OTTO F. SCHNELLHARDT

Using their asparagus tops for soil protection and improvement is credited by growers in the East Benton Soil Conservation District near Kennewick in south-central Washington with increases of as high as a ton per acre in yields of this vegetable crop.

A simple rig for handling dormant asparagus top growth efficiently as a "stubble mulch" and getting away from the conventional practice of disking it twice during the December-February

EDITOR'S NOTE.—The author is work unit leader, Soil Conservation Service, Kennewick, Wash.

dormant season has been invented by Dan F. Beegle, one district grower. It is an asparagus shredder, and a machine that has proved successful in breaking up the heavy top growth that results when the asparagus is irrigated and fertilized after harvest to store reserve plant food in the roots. Beegle built two of these machines and sold one to Neil Anderson in the district.

The device consists of a vertical and a horizontal cutting bar, an elevator and a silage cutter. The machine is driven by the power take-off on the tractor. The height of the cutter bar can be regulated from the tractor. A second man rides the shredder, however, and forks the tops in to prevent plugging. Beegle cuts 4 or 5 acres a day with this outfit.

With it, the tops are chopped thoroughly into short lengths and spread behind the machine. The field then is disked to mix the residues with the soil and aid decomposition. One advantage claimed for this method is that the shorter lengths break down more readily and do not interfere with cutting the shoots at harvest time, which usually starts in this area between April 1 and 15 and ends between the first and fifteenth of June. Shredding the tops has been found to reduce soil blowing more effectively than disking alone, because of the uniformity with which the residues are mixed with the soil. The resultant mulch also lessens injury to growing shoots from sand blasting.

Beegle reports increase yields of 400 pounds to the acre from the use of the shredder on his ranch. His 7-acres of asparagus has not reached full production, and he believes the yields will be further benefitted as the plants attain full bearing age.

Representative of the benefits resulting from returning asparagus top growth to the soil is the experience of William and Frank Gerber in the East Benton district. A 40-acre field of theirs on which the two tons per acre of tops was returned to the soil produced 176 tons of marketable as-

(*Continued on page* 72)

The shredder at work. Heavy top growth at right, evenly spread residue mulch at left and bottom.

Close-up of earth-cutting lug on one of the planters. The machine works equally well on wet ground or dry.

Two Home-made Tree Planters

By MARION M. WEAVER

and RAYMOND N. FISHEL

Wartime labor shortages, and the tree-planting problems of two farmers in Cattaraugus county, N. Y., furnished the incentive which resulted this past year in two home-made but efficient planting machines being devised by the authors of this article. The machines differed greatly from each other, except for the fact that each was made at trifling cost out of materials found on the two farms.

When Mayne Howard, whose farm is near Franklinville, N. Y., faced the prospect of hand-planting 30,000 trees by using the conventional mattock, he decided he needed some sort of mechanical contraption that would save time and labor. Because Howard is a cooperator in the Cattaraugus Soil Conservation District, the district directors put his problem up to us. With Howard's help, we contrived the first of the two machines.

This home-made tree planter had as its chassis the front wheels, the axle and the tongue of a wide-tire dump wagon. To each of these front wheels were attached two lugs, cut from a worn road-scraper blade. Each of the four lugs, 18½ inches long and 5 inches wide, was bent L-shaped, with one side 8 inches long and the other side 10½ inches. The 10½ inch side was curved from a point 6 inches from the L to the sharpened end. This made it possible for the lug to pierce the ground more readily and prevented the wheels from sliding.

The clamps which held the lugs to the wheels were each made of 2 pieces of ⅜ inch metal, 3 inches wide and 8 inches long, cut from an old

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Editor's Note.—The authors are, respectively, work unit leader and farm planner, Soil Conservation Service, Franklinville, N. Y.

wagon tire. Holes were burned through the end of the clamps with a welding torch, and two clamps were fastened by half-inch bolts to each lug. The cost of all materials was $1.18.

The machine was weighted as needed by placing large stones on the central framework between the wheels. Because the lugs get out of line when turning at the end of the row, they have to be synchronized after each turn by revolving one wheel by hand so that the parallel rows of holes will be properly spaced in relation to each other.

Three men can plant 1,000 trees an hour with this modified walking plow. Attachments on moldboard cause furrow slice to drop back in furrow after tree is in place.

The planter makes a cut in the ground 8 inches deep and 5 inches across, and it works just as well in wet weather as in dry. When the ground is wet the hole is more like a slit, and the tree is planted by placing it in the slit and tramping each side of it with the foot. In dry ground the curve on the lug makes the soil come out in a clump, which is deposited beside the hole. The tree is then placed in the hole and the clump of earth is packed around it.

With this machine, Mr. Howard has been able to plant 2,000 trees a day, compared with the 1,000 a day which was his average when using a mattock. To prevent excessive drying of the soil, just enough holes for one day's planting are dug in the morning and then the trees are placed and the soil packed around them.

Inspired by our success with Howard's planter, we decided to go a step further and design a planter that would not only dig the hole, but also virtually plant the tree in the same operation. Never having seen a tree planting machine except the one designed for Mr. Howard, we started from scratch.

We borrowed a walking plow from Howard Morris, a farmer who had trees to plant and was short of labor. We removed the moldboard and installed a new one to which "alterations" had been made. The alterations consisted of four pieces of steel wagon tire, 3 inches wide, laid on the plow with the curve down. The joints had been "spotted" with a welding torch just enough to hold it together for moving. Then the new piece was laid on the welding block and the seams joined with a continuous weld. Holes were bored to match the ones in the frame which held the original moldboard.

The altered moldboard allows the furrow slice to fall back in the furrow instead of turning it over. At the time the furrow slice is passing over the moldboard, a tree is placed in the furrow. Then the furrow slice falls back on the root. Drawn by a rubber-tired tractor, the planter requires three men to operate it: one to drive the tractor, one to place the trees and a third to hold the plow and tamp the tree with his foot. Three men would seem to be an extravagant use of manpower, until it is considered that they can plant 1,000 trees an hour by this method.

We haven't finished with tree planters. Next year, we plan to develop a still better machine—one that will tamp the trees automatically and also provide a seat for the tree-placer.

STUBBLE MULCHING

(*Continued from page* 71)

paragus in 1943, or from one-half to a full ton to the acre more than the average for the district. This was more than four tons per acre, from a 6-year-old stand.

In 1944, this same field yielded 185 tons, despite unfavorable weather conditions.

All growers in the district put on heavy applications of barnyard manure and commercial fertilizers, in addition to using the top residue. One grower mows his tops, runs them through a hay chopper, uses them for cattle bedding and returns them to the asparagus field with the manure.

Asparagus is one of the main cash crops in the East Benton district. The 1943 crop census of the irrigation districts in this soil conservation district showed a production of 6,449,277 pounds from 1,806 acres, with a total value of $483,701, or $267.83 an acre.

Growing concern for soil conservation and land use problems is evidenced by the recent formation, in the Ecological Society of America, of a subcommittee on soil conservation. The subcommittee forms a group within the society's committee on applied ecology, with Edward H. Graham and C. W. Thornthwaite included in the membership.

WATER SPREADING

By WAYNE H. MILES

Dam and dike type water spreading diversion on Myrl Jowell ranch, 10 miles southwest of Quay, N. M. Dam in foreground plugs small gully; dike and ditch carry flow to spreading area in right background. Dike does not connect with dam, a small opening being left to permit part of flood flow to by-pass to another dike below.

The term "water spreading," a comparatively new word in the vocabulary of ranchers and conservationists in the West, is used to designate a wide variety of gully control and flood irrigation structures. Water spreading has found wide favor among ranchmen because it fills a long felt need for a practical method of gully control on range lands.

Water spreading may be defined briefly as the practice of diverting water from an intermittent stream channel or eroded land to an area where it is loosed upon native grassland to flood-irrigate the sod. When properly designed and carefully installed, spreaders control gully erosion and at the same time increase production of palatable grass.

Reduced to its simplest form, a spreader may consist of a single furrow or small ditch leading from a channel to an area not wetted in low flows. Some of the larger spreaders, on the other hand, are made up of rather complex combinations of large dams and dikes designed to flood a section or more of land.

Water spreading has proved popular with ranchers. For about two months in the spring of 1943 almost the only green grass on the Chapman brothers' 30,000-acre ranch south of Endee, N. M., was some 500 acres in a large water-spreading system. This spreader was flooded by a rain late in the fall of 1942, but there was not enough rainfall in 1943 to permit a spread of water, yet, the carry-over of soil moisture resulted in an excellent growth of grass.

Gullies cutting back from the side of Charco Draw on the J. A. Kinkead ranch south of Montoya, N. M., threatened to ruin an especially productive grass flat. A spreader dike, built parallel to the draw in 1940, has put a stop to gullying, and the diverted water spreads over an old flood plain to grow more grass. Another spreader on this ranch protects a spring.

Shoestring gullies leading out from the base of Circle S mesa on the Myrl Jowell ranch near Quay, N. M., caused livestock to travel long distances to reach grass and barred the path to range riders.

Editor's Note.—The author is district conservationist, Soil Conservation Service, Tucumcari, N. M.

Water spreading below a diversion dike on Horace Horne ranch, 2 miles south of Bard, N. M. This diversion picks up water above gully headcut. Note how part of the water spreads through the opening in foreground, and part passes on down ditch to spread through openings in background.

Spreader dams built in 1942 control erosion and provide crossings.

The road to Herman DeOlivera's ranch was so badly gullied in the fall of 1941 that it was almost impassable. Spreader dams in the gullies and road bars in the road have controlled most of the erosion. One of the spreader dams serves as a road crossing.

These examples show some of the possibilities of the practice and illustrate why it is in such good favor with ranchers.

Many factors must be considered in order to arrive at a safe and economical design for spreader work. Technical guidance is commonly sought from Soil Conservation Service technicians.

During the last four years the Canadian River Soil Conservation District of Tucumcari, N. M., has cooperated with several ranchers in laying out and constructing large and small water spreading systems on 7,100 acres of range land, as a part of well-rounded conservation plans worked out with individual operators.

The relationship between acreage in a spreader system to acreage in drainage is of prime importance. Care is needed to avoid over-developing a large spreader area which does not have sufficient drainage above to provide adequate flows for spreading; or, on the other extreme, has too small a spreading area compared with the drainage, with the result that too much water running back into the drainage below the spreader causes erosion. A ratio of 10 acres of drainage to one acre of spreader area is considered about right for the Canadian River District, with ratios of 5 to 1 and 25 to 1 being the extreme limitations.

It must be kept in mind that most flows will be low, and that extensive spread must be obtained from them. There often is a tendency to design spreaders so that satisfactory spread is obtained only under maximum flow.

Applying the experience of local ranchers and their own observations and study, Soil Conservation Service technicians have assisted the district board of supervisors in developing general guides and specifications. These recommendations are based on local conditions, but may provide some usable ideas to persons interested in this type of conservation work in other localities.

Care must be taken to see that overflow from the spreader returns to the channel with the minimum of cutting. At times, a stable, natural channel is available. In other instances, it may be necessary to return the water to the channel by vegetated or mechanical structures.

Sand spreading from seriously eroding channels is a problem frequently encountered. Some light sanding or silting may be permissible, particularly if only relatively small areas are damaged. Construction of the diversion dam at a point where it will provide a silt storage reservoir is often indicated for the prevention or delay of sanding in the spreader area. Where the problem appears to be serious, the first dam may be built at the lower of two or more alternate sites with the expectation of later building at another site when the first dam becomes filled with sand and silt. Fencing the silt basin and part of the channel above diversion structures allows grass, weeds, willows, and other vegetation to start. This serves to screen out silt. The desilting effect of spreaders is excellent and may be used to advantage to protect retention structures such as stock water dams and irrigation reservoirs.

An eye for picking points of diversion which will achieve the maximum of spreading with a minimum of structural work is highly essential.

Some points meriting consideration: 1. locate, if available, a site above a gully headcut, thus avoiding the construction of an expensive dam; 2. place the diversion works as nearly as possible at the upper end of a favorable spreading area; 3. build the structure at a narrow and shallow point in the drainage in order to reduce the size of the dam; 4. look for places where the banks of the channel below the point of diversion are higher than the surrounding grassland and will prevent water from returning to the gully; 5. look for old grassed channels into which water can be diverted, thus avoiding the need for a dike or ditch; 6. try to choose a spot where no channel has been formed, and where part of the water from extreme flows can be by-passed safely; 7. select sites with safe and adequate spillways; 8. put diversion dams just below a bend in a gully channel, where possible, to allow flood waters to jump the gully bank with-

Water spreading on Chapman Brothers ranch, 8 miles south of Endee, N. M. This spreader dam plugs a small gully not visible here, and water spreads around both ends of the dam.

Grass growth resulting from water spreading. This is a repeat of the picture above. Grass is a mixture of galleta and blue grass.

out changing direction of flow, as this often reduces strain on structures; 9. choose sites where a cut spillway will reduce the size of dam required (one dam on the Canadian River District was reduced from 6,000 to 3,500 yards by this means.)

Combination-type structures which serve also as stock dams, road or stock trail crossings, or serve to protect springs are particularly favored.

Large gully control dams should be constructed with minimum front slopes of 3 to 1 and back slopes of 2 to 1. A 7-foot crown width should be the minimum, and on higher dams this crown width should be equal to one-third the maximum height of the dam plus 5 (on a dam 12 feet high at the center $\frac{12}{3}$ plus 5=9-foot minimum crown).

An adequate spillway cross section to pass high flood flows is very necessary. The cross section required should be determined by the size and type of watershed, and should be based on the maximum storm to be expected once in 25 to 50 years. Two feet of extra dam height or free board may be added to the required spillway as a safety factor.

It has been the practice in the Canadian River district to design dikes to carry a flood flow to be expected once in 25 to 50 years without additional freeboard. Some overtopping is anticipated, but repair costs are not excessive and occasional maintenance is often less expensive than building the dike to take care of extreme flows.

The size of diversion dikes and ditches is governed by the head to be handled and the area to be watered.

Dikes should be designed at the proper grade or fall so that they will carry the maximum flow without causing erosion in the channel. The grades shown in Table 1 for various height dikes are considered adequate for average conditions in the Canadian River district. These grades also will be approximately correct for ditches having the same depth. Flow velocities of 2 to 2½ feet per second are recommended where there is a ditch above the dike or where soils are none too stable.

TABLE 1.—*Grades for diversion dikes.*
[Computed from Manning's Formula using n=0.04]

Height of dike, or depth of ditch	Recommended grade in feet per 100 feet	
	V=2.0 ft.	V=2.5 ft. per sec.
Feet:	Feet:	Feet:
1.0	0.73	1.14
1.5	.43	0.66
2.0	.29	.45
2.5	.22	.34
3.0	.17	.26
3.5	.14	.22
4.0	.12	.18
4.5	.10	.15
5.0	.09	.13

On heavy sod and in stable soil the velocity of flow above a dike may be increased perhaps to 3 or 3½ feet per second provided the borrow ditch is on the lower side only and the sod is not disturbed above the dike. (Doubling the grades in Table 1 for V=2.0 feet per second gives a velocity of 3 feet per second.) This method results in reducing the size of dike required and has cut construction costs on several dikes in the Canadian River District.

Severe gully erosion on J. A. Kinkead ranch, 15 miles southeast of Montoya, N. M. Erosion in this headcut has been stopped by diversion dike showing as dark line above headcut. Diverted water spreads over grass to increase production.

TABLE 2.—*Carrying capacity of dikes in cubic feet per second.*
[V=2.0 ft. per sec.]

Heights of dikes on recommended grades	Cross Slopes								
	0.5 percent			1 percent			2 percent		
	Low grass 0.2 ft.	Med. grass 0.5 ft.	High grass 0.8 ft.	Low grass	Med. grass	High grass	Low grass	Med. grass	High grass
1.0	150	50	20	75	25	10	35	15	5
1.5	360	200	90	180	100	45	90	50	20
2.0	700	440	250	350	220	125	175	110	60
2.5	1160	820	550	580	410	275	290	205	135
3.0	1710	1320	940	855	660	470	430	330	235
3.5	2370	1940	1470	1185	970	735	590	485	365
4.0	3200	2620	2080	1600	1310	1040	800	655	520
4.5	4050	3480	2800	2025	1740	1400	1025	870	700
5.0	5000	4440	3650	2500	2220	1825	1250	1110	910

Table 2 gives the capacity of various sizes of dikes. The dike capacity is affected by cross slope or ground slope, height of grass, and fall or grade. Grass height has been divided into three classes, low, medium and high, for each cross slope and height of dike. This table is based on design grades as shown in Table 1 for velocities of 2.0 feet per second.

By extrapolation, Table 2 may be used for greater cross slope (ground slope). For example the capacity of a given dike on 3 per cent cross slope is 1/3 the figure shown for a 1 per cent slope and the capacity of a dike on 4 per cent slope is ¼ the figure shown for a 1 per cent slope.

As velocities of flow are increased the capacity of the dike increases. Therefore, the capacity of a dike designed for a flow of 2.5 feet per second is 25 per cent more than the figure shown in Table 2. The capacity of a dike designed for 5.0 feet per second is 50 per cent more than the figure shown in Table 2.

The necessity for a type of supplemental structures will depend on topography, slope, soil, and vegetation as well as the equipment and materials available. Construction of many of these structures can be delayed until after the spreader has functioned in order to see just what is needed.

Flat slopes with a fall of less than 3 feet in 100 feet and a heavy sod of such grasses as galleta and tobosa cause maximum spreading with a minimum of supplemental structures. Such conditions are usually found in flood plains.

Graded dikes, ditches, and furrows of the type shown in Figure 1 may be used to get a better spread where natural spreading below the diversion structure is not adequate, or where concentration of water might lead to further erosion if not checked.

Percolator structures of loose rock, brush, or wire have been widely used in other areas as supplemental structures but have not been used to any great extent in the Canadian River district because of the rather high labor outlay necessary for this type of construction.

Active gullying at the point of diversion often prevents the very desirable practice of diverting only part of the flow and allowing the rest to continue down the same channel. On supplemental structures, however, it often is possible to pick up only part of the flow. In this case, the diversion may be designed to carry only enough water to flood a given area instead of the entire flood flow of the channel. The head necessary for a given area will vary but one second foot per acre; or one second foot for each two acres to be watered is a good average.

A wide variety of structures may be used, and a wise choice is called for, as the value of increased grass growth should in most cases govern the cost of construction. The protection of valuable property threatened by the gully or by deposition from the gully will often, however, justify more expensive structures.

Before construction starts, the site should be properly prepared in order to insure that the fill will bond properly with soil. Vertical or very steep banks should be cut down to a slope of 2 to 1 or preferably 3 to 1. This slope should be cut to the very bottom of the original bank. Brush, weeds, and grass should be cleared off, and the site of the dam or dike should be plowed or ripped before the fill is started. A keyway should be dug to good material if the gully bottom is sandy. Where dams are high or soils are unstable, fills should be put in moist and given some compaction. The completed structure should have 10 per cent added height to allow for shrinkage.

Spreaders constructed to date have generally doubled the yields of grass. This would indicate

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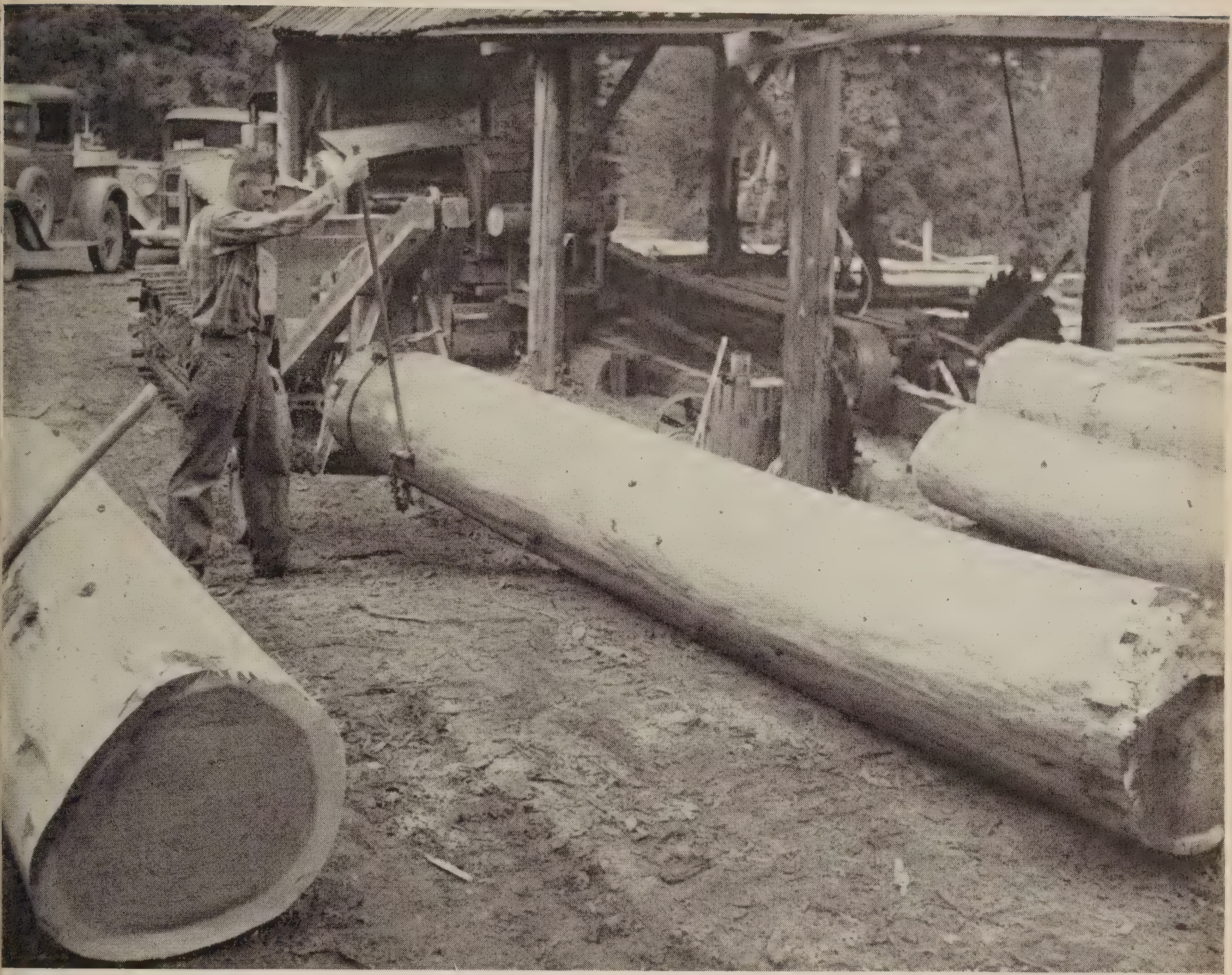
FARM FORESTRY TO THE RESCUE



George E. Tindall bringing a redwood log to his sawmill.

By FRANK B. HARPER and IRVING F. PEARCE

Distributors in the Watsonville, Cal., vegetable and fruit growing area can testify to the war-time importance of containers and other woodland products that George E. Tindall and others are supplying from their local farm timber.

To Tindall, an old hand at making the best use of farm timber, there is the three-way satisfaction of turning out badly needed war materials, making a good profit, and harvesting his tree crop to assure a sustained yield in days of peace to come. This is in the coastal redwood belt.

By 1943, a critical shortage of fruit and vegetable boxes and crates developed as a result of curtailed commercial timber manufacture and the draining off of labor for military service and war plant work. The Pajaro Valley alone uses approximately 2,000,000 new apple boxes a year and about the same number of lugs, carrot or lettuce crates, artichoke boxes and the like. In casting around for new sources of supplies, distributors contacted District Conservationist Clyde M. Seibert and other Soil Conservation Service men working with farmers of the Pajaro Soil Conservation District and the old Corralitos Creek erosion control demonstration project. They, in turn, passed the work along to Tindall and others, following up with technical assistance and information on markets, sawing methods, and equipment.

The war job fits in nicely with Tindall's farm forestry operations. Ever since 1898, when he hewed a farm out of the woods in Eureka Canyon 13 miles northwest of Watsonville, above Corral-

Editor's Note.—The author's are, respectively, head of the current information section, Soil Conservation Service, Portland, Oreg., and work unit conservationist on the Pajaro Soil Conservation District, Watsonville, Cal., Soil Conservation Service.

itos, he has harvested woodland products. He cuts on a selective or sustained-yield basis, harvesting only mature trees or those which are defective or diseased, leaving the thrifty, rapidly growing young and middle-aged trees for future harvest, instead of clear cutting and laying his land bare to erosion, fire and useless brush growth.

In 1942 Tindall harvested $1,752.45 worth of products from the 200 acres of woodland that makes up the biggest part of his 260-acre place. He realized from lumber, $600; tan bark, $615; fuel from oak, madrone and redwood, $250; Christmas trees, 199.15, and huckleberry and fern sprays, $88.30. He also has sold fence posts, pickets, grape stakes, piling, bridge stringers and decking, sawed shakes, and rustic for log cabins and pergolas.

It was in 1938 that Tindall installed a small American mill, cutting 75,000 to 80,000 feet of lumber a year from his second-growth redwood. When the fruit and vegetable container shortage developed, he and his son Weldon decided to add their own shook manufacturing equipment and turn out container material, both for the Tindall farm itself and for other farmers.

This is how the 1943 production record for the Tindall farm added up: 80 thousand board feet of car stock (bracing and bulkheads), $3,600; 12 thousand board feet of shakes, $450; 20 cords of tan bark, $500; 15 cords of fuel (oak and madrone), $300; 70 cords of fuel from redwood slabs as a by-product from the shook manufacture, $840; 250 Christmas trees, $250; and $70 worth of huckleberry and fern sprays. The total return from these products was $6,010. The 1944 output is expected to run about the same.

The Tindalls—including even Mrs. Tindall, who takes her turn at stacking shook and doing other labor relief jobs around her husband's mill—did not attempt to make the completely nailed product. Instead, they made and sold box shook for Los Angeles lugs, in which are marketed tomatoes, early potatoes, squash, apricots, plums, peaches, cherries, grapes, sweet potatoes, egg plant, peppers, cucumbers and other products. They also made car strips, grape lugs and vegetable crates. The crates are used for peas, carrots, spinach, onions, beets, turnips, radishes, lettuce, broccoli, cauliflower, celery, cabbage and snap beans.

Others in this area who are manufacturing essential items from their farm woodlands include O. R. Watts, 2 thousand board feet of shook a day; Lawrence Cusack, 3 thousand board feet of tree props and lumber a day; Peter Tuana, 100 redwood posts a day; and F. M. Pohl, 2 thousand board feet of shook a day. It is all "extra" income.

Local dealers looked for the 1944 shook situation to be about the same as it was in 1943. Their appreciation of these locally developed sources of supply is reflected in the comment of A. L. Waugarman, a large-scale Watsonville shook dealer:

"The material from second growth redwood is satisfactory for shook. I'll take all that is supplied to me. The output from any one mill is not so great; it is the combined output of many small mills that counts."

Tindall estimated that he had a million and a quarter feet of marketable redwood when he started his mill six years ago, and Soil Conservation Service foresters place at approximately 10

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Tindall makes shook for vegetable and fruit containers with special machinery he bought in 1943 for the wartime job. Looking on approvingly is John F. Preston, chief of the forestry division of the Soil Conservation Service.

Jim Fort Rast was front runner in a state-wide essay contest sponsored last spring by the South Carolina Bankers Association in cooperation with soil conservation district supervisors. He won a $75 war bond, and the satisfaction of producing a manuscript that would have done credit to many of his elders. Two second-place awards went to top contestants from the Piedmont and Coastal sections of the state, and there was a further break-down of prizes on a county basis. The competition was financed by contributions from individual banks. The project resulted from "the interest of bankers in problems of the farmer and in the development of a better program of agriculture in South Carolina. It is hoped that this activity will aid in stimulating interest among youths and adults in the importance of conserving our natural resources."

There is no sadder sight . . .

By JIM FORT RAST

Near my home at the foot of South Carolina's sandhills, there are several ruined farms. All of them follow the same general pattern as the Old Martin place, whose case I shall present. The main "attraction" is the ruined house, with its gaping windows. The one disillusioned Negro tenant on its six hundred ill-kept acres lives, with his family, in a less leaky hovel which was once a barn. All about is the flavor of ruin—broken plows, empty cans, rusted pots, and rotted wood—all telling the sad story of neglect. The fields are full of gullies and broomsedge.

There is no sadder sight. When the grandfather of the present owner moved here, the fields had just been cleared. He grew fabulous crops and built a fine house which was far renowned for the graciousness and hospitality of its occupants.

Grandfather Martin reared 11 children on that farm. They all grew up to be prosperous. So what did it matter if the heavy rains were allowed to take their natural course, breaking furrows and washing away valuable top-soil? What did it matter if, every few years, new ground had to be cleared to replace eroded fields? The woods and fallow fields were burned each year, and those fields, unprotected by vegetation, were soon gullied and useless for cultivation.

In short, by the time grandfather was old, he was forced by failing crops to move to town in order to live in the manner in which he was accustomed to living. In town he died, leaving his son James in possession of the farm. James, in order to live well, cut all the timber ruthlessly and further mined the land.

James reared his family on the farm and died there. But his children did not want to live on the farm. And so tenants took over, their quality receding from well-to-do white to poor white, from average Negro to poor Negro. Soon the poor Negro will move away, disappointed and underfed, leaving the farm as the perfect example of ignorant waste.

The winner—Jim Fort Rast, 16, Swansea, S. C., receives war bonds as first prize in statewide essay contest on soil conservation. Left, E. C. McArthur, Gaffney, S. C., president of South Carolina Association of Soil Conservation District Supervisors; right, E. R. Alexander, secretary of South Carolina Bankers' Association.

This farm had sent 19 children out into the world to become prosperous. While it was still rich it had supported some 80 people, counting tenants. It had paid large amounts of taxes to the local, state and national governments. The trade which it helped to bring enriched the nearby town. It was the foundation of the nation. In time of trouble, it was always ready to contribute. It can, alas, no longer carry on its fine work. *It is gone.*

It is easy to look back and think of what might have been done. It is easy to say that this waste could have been prevented as easily as not. But now it is too late.

Had a modern progressive farmer been in charge he would have terraced the fields to hold the rain and prevent erosion. He would have constructed barriers to hold back the soil.

Perennial crops such as kudzu, sericea lespedeza, and alfalfa would have kept the steep land in use, prevented erosion, and provided enriching humus.

The forests would have been cut wisely, and reseeded after cutting, so that there would always have been a source of money in lean times. Shelter belts of trees would have been planted to prevent wind erosion.

A modern progressive farmer would not have burned off the fields and woods each year. This wasteful practice of burning off sent valuable, soil-enriching vegetation up in smoke, and also destroyed most of the cover for game on the farm.

Contour plowing would have been used to prevent the water from running off. Strip cropping, (alternating strips of sod crops and cultivated crops), would have helped further to hold the land in its place.

Rotation of crops would have prevented fields from becoming "worn out" by continual planting of one crop year after year. If lands had become worn out, they would have been planted in trees, soil enriching plants such as crotalaria, or turned into pasture.

These things could have been done, but they were not done. Because they have not been done widely in South Carolina, our crops are failing. Our commerce is dwindling, little by little. Our people are becoming ignorant and underfed. These facts may seem of little importance during a war, when high wages are being paid to everyone able to work, but after the war they will be of the greatest importance.

Our soil is going into the sea. Streams that were once wide, deep, and constant in their flow are now clogged, sluggish, stagnant runs, low in dry weather and flooded in wet. Floods gather quickly from eroded areas. The water table is going lower and lower. Ask the local "pump man"; he knows, and curses the fact.

To get our farmers to save their soil, we must show them the value, the common sense, the urgent necessity of saving it. If one man in a neighborhood engages in those conservation practices, the others soon see their value, and use them also. We cannot simply tell them, we must *show them*. We must show them that these common sense methods will bring them profit and happiness.

If we do not show them, we in South Carolina are doomed. There are no more places to move to. We are, literally, "stuck" where we are. With little money in our banks, and with ignorant, underfed people forming a majority, we cannot survive as we are today. Farms that buy little and pay no taxes are liabilities instead of assets.

We must show our farmers. We *must* keep up with the rest of the world. We *must* excel.

We can.

WE SHALL!

DISTRICT WORK GROWS

During the first six months of 1944, according to R. W. Rogers, chief of the records and reports division, Soil Conservation Service, 26,925 farm and ranch conservation plans covering 7,867,234 acres were prepared in soil conservation districts. This planning rate represents an increase of 19.4 percent in number of plans and 8.1 percent in acres planned, over the same period last year.

As of June 30, 288,036 farm and ranch plans covering 62,118,997 acres of land had been prepared, and approximately 31,444,046 acres had been treated in the regular district program.

In recent months the organization of soil conservation districts has shown substantial increases:

	New districts organized
April 15 to May 15	48
May 15 to June 15	26
June 15 to July 15	26

As of July 15, a total of 1,140 soil conservation districts had been organized comprising 634,558,948 acres. In these districts there were approximately 2,462,000 operating units and 2,926,000 farms.

During the fiscal year ending June 30, 1944, 209 soil conservation districts comprising 78,745,790 acres were organized. During this same period 172 additions were made to 120 districts that had been previously organized. These additions totalled 23,863,634 acres.

Governing bodies of 1026 districts, totaling 583,309,059 acres, had signed basic memoranda of understanding with the Department of Agriculture and 1014 had signed memoranda of understanding with the Soil Conservation Service. At this same time there were 192 petitions for district organization pending.

ICELAND'S son works on problem of shifting sands

By FRANK B. HARPER

A trip afield with Páll Sveinsson constitutes a fair travelog on the North Atlantic country of Iceland, whose shores he left for the first time in the summer of 1943 to come to the United States for several years' work and study of soil conservation.

You learn, for example, from this flaxen-haired, proudly Scandinavian Icelander that the land of the Eddas and Leif Ericson is not just a bleak and barren dot in the cold ocean, notwithstanding the fact that approximately one-tenth of its some 25,000,000-acre land area is ice capped. Nor is Iceland altogether a fishing country, though fish and fish products are the island's principal exports.

In short, Páll tells you in the surprisingly good English, which he taught himself after arriving in the states, that "Island," as it is spelled in his language, has a substantial agriculture in the year-round mild climate below the glacier line. Wool, hides, meat, cheese and butter are its principal agricultural exports. Ever since he finished at the northern Iceland agricultural school called Holar, this son of Svein has had his eye set on helping to make that agriculture better. When he turns homeward again, after two or three years' study of agronomy, forestry and other subjects, beginning this fall at the University of Minnesota, he will be better trained to resume the work he followed for three years in his country's soil conservation bureau.

Cat-tails were a form of vegetation new to Iceland's Sveinsson.

Páll Sveinsson takes notes on beachgrass planting and other techniques by which the Soil Conservation Service has stabilized a 16-mile stretch of sand dunes along the Oregon coast below the Columbia River. With him is Robert L. Brown, manager of the Astoria nursery unit.

A farm boy from south Iceland near Vik, 150 miles east of Reykjavik, the capital, Sveinsson is on a trip sponsored by his government but made partly at his own expense. His first year here has been with the Soil Conservation Service. During that time, he has studied erosion control and plantings in soil conservation districts and Ser-

vice nurseries and projects in Michigan, Texas, Oklahoma, Kansas, Nebraska, North Dakota, Montana, Washington and Oregon. It was in the last named Pacific Coast state that the visitor from Vesturskaftafllysysla, one of Iceland's 20 counties, found the mother lode of information bearing upon his country's soil erosion problems, sand stabilization.

Some 10,000,000 acres in Iceland are in grass and crops, Sveinsson estimates, divided in this manner: 8,000,000 acres of open range, and 2,000,000 acres in pasture and crop land, the crop land amounting to about 100,000 acres. The other 15,000,000 acres include mountains ranging from 2,500 feet to 7,000 feet elevation, lava flows, and sandy areas which alone total around 2,000,000 acres. Though Sveinsson is not a forester and Iceland has a separate forestry bureau working on farmstead plantings and the like, he will tell you that when his forbears went to Iceland a thousand years or so ago, much of the island was in timber, lava flows on this island of volcanic origin having destroyed some.

Earliest spoken records handed down, stumps found both in the valleys and the uplands, and woodland remnants that have been protected all bear witness that there was timber mostly birch, willow and ash. There were no conifers. Generations back, however, Iceland became popularly known as "treeless," after almost all of the never large supply of timber had been cut off for fuel, building and other uses. Partly because of cool, virtually sunless summers, tree growth there is slow at best, Páll explains; but an early developed sheep industry destroyed the seedlings and, subsequently, other vegetation under overstocking. This, despite a rainfall of 100 inches or more a year in places, was followed by severe wind erosion in the sandy areas.

About 30 years ago, Gunnlaug Kristmundsson, who heads Iceland's soil conservation bureau, initiated a program aimed at the protection of the land. Today, under a soil conservation law, an agriculture department work unit in charge of a foreman may be found in nearly every county. Sveinsson is enthusiastic over the United States system of farmer-organized and farmer-administered soil conservation districts.

He explains, though, that a comparatively small amount of Iceland's agricultural land is in private ownership. This land lies chiefly in the 100,000 arable acres ranging from small potato farms to ranches of 300 acres or so. Some private owners, he adds, find it to their advantage to sell to the government and then continue to operate their

Drainage is another task facing Iceland's soil conservationists. With Regional Conservator J. H. Christ, young Sveinsson here inspects drainage work that farmers in the Sauvie Island Soil Conservation District near Portland, Ore., are doing to bring tule-infested lands into war crop production.

Sveinsson watches C. Dondo farming Sauvie Island land that a year ago was cat-tail swamp. It's on the Porter W. Yett place.

places under the careful management plan that the government requires to be followed by farmers on its lands.

Comparatively limited, Páll explains, is the acreage of strictly government-owned land. Instead, the bulk of the range and pasture land is county-controlled. Unfenced and unpatrolled, this grazing land is operated as open range, presumably with herds of a given county using the range within that county, but with little restriction on stocking and use. The Iceland soil conservationist sees an opportunity for much range and pasture management development, both in the sandy areas and elsewhere, and is giving considerable attention to this phase of land use during his studies here. He also is interested in tree planting possibilities for erosion control in upland areas that have become too badly washed and gullied for grazing or other agricultural use.

Drainage of peat bog-type lands is another soil conservation problem faced in Iceland. Some machinery, mostly draglines, has been brought in and used in drainage work, though there is need for marked expansion in this direction. Though Icelanders operate several thousand automobiles, about half of them in the capital, Sveinsson points out that farmers depend upon horses of their own breed, just as their sheep are a special coarse-fleeced type and their cows likewise specially Icelandic, weighing around 800 pounds apiece. What tractors there are, are operated by groups.

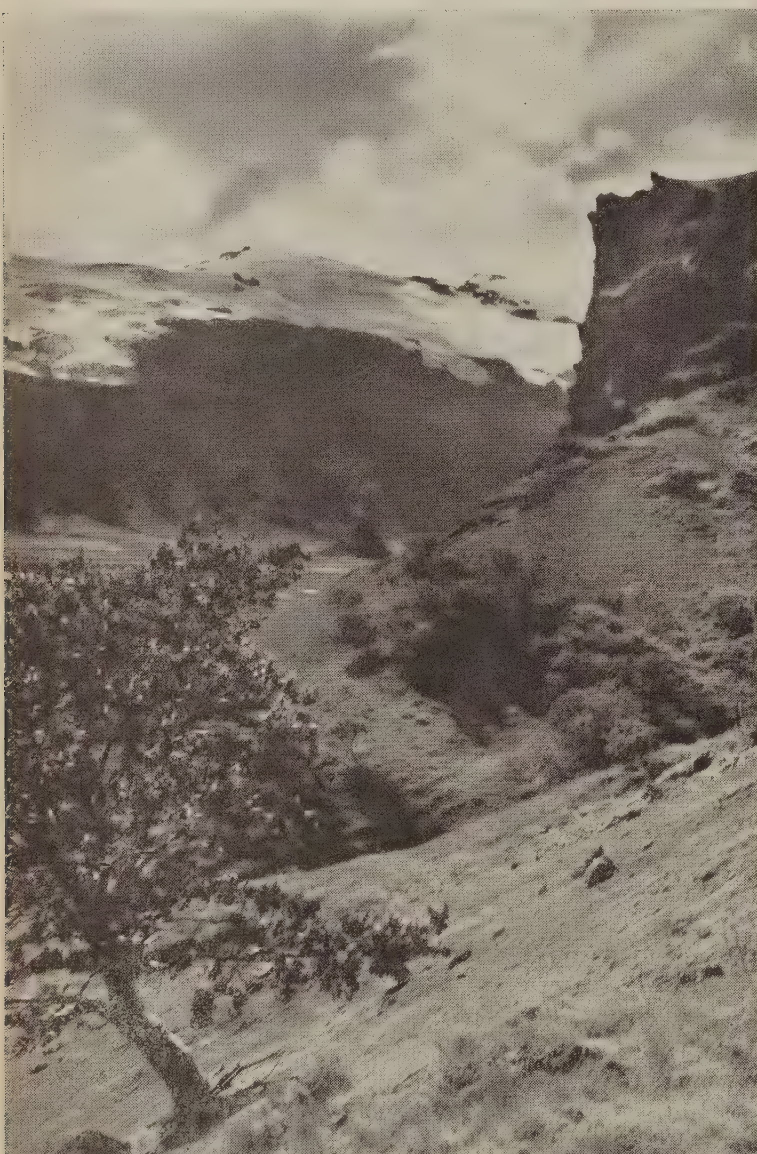
The control of sand erosion in Iceland, as described by Sveinsson, commonly consists of building low walls of rock, or barriers of driftwood that the Gulf stream obligingly supplies free to Icelanders. The control area is fenced against livestock and, when the barrier fences, some 250 feet apart, are covered by sand, European dune grass (*Elymus arenarius*) is planted. Some areas of once-drifting dune sand are now in pasture and hay.

On the north Oregon coast, where a 16-mile stretch of dune area has been stabilized so successfully under Soil Conservation Service direction that it has received international attention, the Iceland conservationist learned by actual practice how the sand-stilling European and American beach grasses are planted and followed by permanent, forage-type perennial grasses and legumes or by trees and shrubs. He also studied seed-collecting and other techniques at the Astoria Nursery Unit, which is in charge of this work that already has stopped completely the once alarming dune erosion threat to millions of dollars worth of agricultural land, military installations, municipal and other improvements.

Sveinsson's aim is to find out all he can about sand stabilization methods to improve his own country's control work, both in protecting the sandy lands themselves and in developing better forage. He also studied forage and other plant development and increase work at the Service's Pullman, Wash., nursery unit. Mild winters enjoyed at the lower elevations because of the Gulf stream's influence make it possible to use pastures

(*Continued on page* 86)

Iceland's brave soils face tough opposition



Water and wind eroded slopes in Thórsmörk, southern Iceland.

By HAKON BJARNASON

Winds blowing over Iceland are damp as they approach the coasts. But on their way over the highland they become dry and carry the dust down to the lower regions, where much of it becomes embedded in the greensward and is thus added to the soil. All Icelandic soil has been built up in this manner since the end of the last glacial period, which, in the opinion of most geologists was about 8 to 10 thousand years ago.

The theory of Tutkowski concerning the conditions for the formation of loess soil will gain its strongest support in Iceland where the loess soil is still in the making, and the study of loess for-

Wind erosion after woodcutting.

mations can hardly anywhere be carried out under more favorable conditions.

The thickness of the Icelandic soil differs greatly, from a few centimeters up to 6 or 7 meters, according to its age and position. Even the marshes are loess formations to a certain extent, as up to 60 percent of their mass is made up of minerals carried through the air.

The comparatively young loess soil is very liable to leave by the same route it came, to be blown away as soon as its vegetation is damaged or injured to such an extent that wind and water can come in close contact with the soil. In fact, Iceland has suffered severely from soil-erosion and destruction of vegetation during the 1,000 years the country has been inhabited.

Loosely estimated, not more than 17 thousand square kilometers of the whole area of the country which is below 400 meters is covered with a contiguous vegetation.

Vegetation existing above this level of 400 is both so scanty and has such small utilitarian importance, that it can hardly be reckoned with. It is hard to stay for certain how big the area was which had a contiguous cover of vegetation before settlement. Some 43,500 square meters are less than 400 meters above sea level. Part of this area is in lakes and rivers, part of it is made up of sand deserts adjoining glaciers, continuously washed by rivers and glacial streams. The total area of such sand deserts is about 4,000 square kilometers, and rivers and lakes and new lava beds probably cover a similar portion of the land. Anyway, about 34,000 square kilometers below 400 meters must have been covered with vegetation at the time of the first settlers.

Above an altitude of 400 meters the extent of the vegetation has indubitably been much bigger than now, but as this vegetation has never been of much practical importance, it will not be further discussed here.

As already stated, about half of the area of vegetative growth which existed in the country

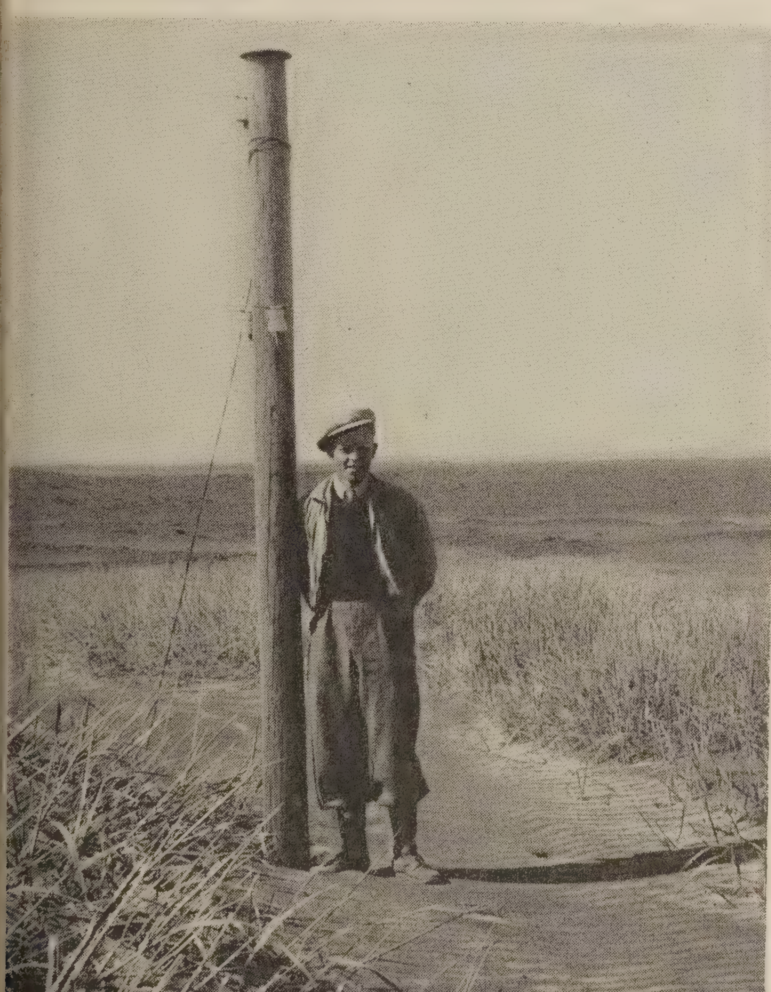
at the time of the first settlement has been totally laid waste. We know for certain that a great part of the land of vegetative growth was formerly covered with birch wood and birch-copse, and this vegetation has reached 400 meters above sea level or even more. Arborescent plants such as willows and heather have also been much more common than they are now but, on the other hand, all marshy vegetation was greatly inferior to what it is at present, the evidence of which can be seen in many of the marshes.

Besides the fact that the land bearing vegetation has been reduced by one-half, the quality of the present vegetation is much inferior to the quality of the ancient one.

There are three possible reasons for the colossal destruction of vegetation and the land bearing it: 1. Increasing severity of climate, 2. volcanic eruptions and their effects, 3. exploitation through excessive grazing.

We do not have complete evidence as to climatic conditions through 1,000 years, as pollen-investigations in marshes, which might throw light upon the subject, have not been conducted. We do, however, have written sources of information running as far back as the year 1200. These sources seem to indicate that hardly any radical change in climate has occurred. Accordingly, there is little justification for blaming the destruction of soil and vegetation on altered weather conditions.

Post-glacial basalt on tuff and breccia, southern Iceland.



This telephone pole dates from 1922.

Volcanic eruptions have been very frequent from the first years of Icelandic settlement up to our time. The effects of these eruptions have usually been merely local, although the biggest ones have made themselves felt all over the country by the fall of ashes. Although a considerable area has been covered with lava-fields, this is not a very big percentage of the country as a whole. The ashes, however, are carried by the wind and are frequently injurious to vegetation; when striking places where soil erosion is in its first stage, ash-falls may have catastrophic consequences. It is a well known phenomenon, that great quantities of ashes can dry up marshes, making the latter liable to wind erosion. In spite of this, volcanic eruptions can not be considered a major factor in the destruction of soil and vegetation. If other destructive forces did not step in, the wounds thus inflicted would heal very soon. Proof of this can be seen where volcanic eruptions have taken place in uninhabited areas.

The third reason for destruction of soil and vegetation, and the most effective one, is the exploitation of the land by the people living on it.

Destruction of the woods removed the best defense of the soil, and conditions for the beginning of soil erosion on a large scale were at hand. When the protective forest had disappeared, wind and water had free access to every hole in the grassward and continuous grazing made its contribution to the disaster.

The best proof that it is the grazing which is mostly to blame for the erosion of Icelandic soil, rather than the weather or other uncontrollable forces and that it is the grazing, too, which maintains erosion more than anything else is to be found in the various wind eroded enclosures. Where the land is fenced and protected against

A typical loess soil brink in southern Iceland.

all grazing animals, it most often regains its cover, even though no seed is sown and only small tufts of growth have been left in the area. The most striking fact is, that high and big loess-brinks which were rapidly dwindling by this process, ceased being a defenseless prey of erosion with the return of vegetation to their sides.

Even if the general situation in livestock breeding has improved very considerably in recent years, the land is probably still suffering from excessive grazing. Now cattle graze only in the summer, and the grazing of horses and sheep avoided to every possible extent in winter except in fair weather. If the herds were evenly distributed over the pastures, about 5 horses, 25 cows and 39 sheep would be assigned to each square kilometer. In the more densely populated districts, however, especially in the southern and western part of the country, the number of livestock to each square kilometer is sometimes two or three times this number. Yields of herds are reduced and soil and vegetation are endangered.

I do not know how wide a vegetative area is needed to deal with the situation. This is a problem which has never been investigated here. But considering the difficult conditions all vegetation must meet because of cool and short summers, its resistance to excessive grazing must be much less than in many countries having more favorable climates.

Since 1899, there has been some cultivation of woods in Iceland. In the first years, this was of minor importance. In 1907 reclaiming of erosion tracts was started. At the same time the cultivation of forest was increased. Specially appointed government officials were charged with supervision of such matters. Last year the government spent 540,000 kronur on forestry and reclaiming of eroded areas. From an American point of view, this is not much, as it equals only $80,000 in American money. But in view of the fact that the population numbers only 125,000, this is a sizable though not adequate amount. This sum makes up 0.58 percent of the total public expenses. For the time being, six officials are charged with the supervision of the work.

Fencing has now been completed on 40,000 hectars of eroded tracts. These tracts are recovering, partly due to cultivation and partly on their own account. The areas thus protected are increasing every year. On the initiative of the State Forestry Service about 20,000 hectares have been fenced and protected, but only a fraction of this land is covered with birch-woods or copse. The birchwood spreads very rapidly in many of the enclosed areas, and all the fenced tracts show steady growth.

One of the greatest problems in Icelandic forestry is to grow conifers. Due to the isolation of the country, no native coniferous trees are to be found, except *Juniperus communis, var. nana Willd,* but in recent years a considerable amount of tree-seed has been imported from Alaska with the cooperation of officials of the U. S. Forest Service in Juneau, Cordova and Seward. The climate around Prince William Sound and Cook Inlet is very similar to that of Iceland, and Sitka-spruce from those areas find excellent conditions in Iceland. At the same time, and this is another major problem, the cultivation of Icelandic birch must be given consideration, not so much for the sake of the wood itself, but because it is the country's best defense against soil-erosion.

Progress in the last 40 years in the reclamation of deserted ground has been very good, so good that those who were most optimistic have not been disappointed, and it has fully justified the expenditure of more and more money through the years.

ICELAND'S SON

(*Continued from page* 83)

in Iceland all winter. This situation aggravates overuse, particularly by the sheep, which run in flocks of 100 to 1,000. Dairy stock is on pasture only from April through October. Fish meal, as a by-product of the fishing industry, is coming into wide use for stock feeding.

You get the impression from Páll that the people of this world's youngest democracy are pretty self-sufficient. Though their only fruit consists of wild fruits and berries, potatoes are a main cultivated crop; root crops, cabbage and such, do well. Tomatoes are grown in hothouses supplied by the island's famed thermal springs that are displacing imported coal for general city and farm heating

purposes. Spinning, tanning and other processing still is done largely on the farms.

Iceland is without railroads, but has highways around the south, west and north sides. In addition to the north Iceland agricultural school which Páll attended, and the university at the capital, there is another agricultural school, in southern Iceland. It is called Hvanneyri and is headed by his brother, Runolfur, who also planned a 1944 visit to the United States, to study livestock breeding, farm machinery and other subjects.

A highlight of Páll's visit, while in Portland working with Regional Conservator J. H. Christ and staff under direction of Dr. A. L. Hafenrichter, chief of the nursery division, was watching circus elephants perform at a Victory Center program just outside the regional office windows. The visitor never had seen an elephant in his homeland, where pachyderms decidedly are not native. Even a national-capacity audience in that country of between 125,000 and 130,000 population hardly would tempt a showman to ship such ponderous beasts to the northland island.

REVIEWS

WOODLAND OPPORTUNITIES ON DAIRY FARMS IN NEW YORK. By Hugh A. Johnson, Irving C. Fellows, and Donald Rush, Bureau of Agricultural Economics, and C. R. Lockard and C. Edward Behre, Forest Service, U. S. Department of Agriculture. Washington, D. C. 1944.

This bulletin is a report of a study of how farm woodland management could integrate with other farm activities in New York to enable farmers to make a better living. It should be helpful to all agriculturists and foresters interested in guiding the way to a more stabilized agricultural industry and the betterment of rural communities. It is of particular interest to the Soil Conservation Service because it is with such problems that its farm planning organization is struggling all the time.

A study was made on 90 farms ranging from 60 to 662 acres, all members of the Otsego Forest Products Cooperative Association. The agriculture of the county is predominantly dairying, producing wholesale milk for New York City. The report goes into the economic details of the various farm enterprises, first classifying the 90 farms by income received based upon size of herds. Next, the farms are classified according to size of merchantable woodland, comparing income from the woodland enterprise with that from other farm enterprises. An average net income of $118 per farm is shown from the woodland, and $1,195 from other enterprises. Also revealed is the fact that the woodland expenses were low, consuming only one-third of the gross income, while the expenses of other enterprises consumed 60 percent of the cash income.

The next phase of the report deals with the adjustments which should be made in farm management to increase income. The importance of integrating farm forestry with the farm business is emphasized. The methods of so doing are explained, and the resulting advantages to the farmer are indicated. To illustrate the place of woodlands in the farm organization and the effects of proposed adjustments on net farm incomes, two typical farms were studied, and detailed summaries of present and potential economic factors and incomes are presented. In addition, a study of a third farm was made to illustrate the comparative returns from good and poor farm woodland management practices. These three studies add much to the practical value of the bulletin.

It is interesting to learn what returns can be expected from a northern hardwood woodland of 56 acres when the growing stock is fully developed. The estimated annual cut is 19,000 board feet and 48 standard cords, or 340 board feet plus .86 cords per acre. Logs of high quality should be worth $25 per thousand, and 35 of the above cords should sell at $6 per cord along side the road ready to haul. The total return, labor and stumpage, is estimated to be $685 or $12.20 per acre per year.

A few quotations will help to give an idea of the scope of the bulletin: "As a prerequisite to good forest management the farmer must plan his operations and adopt practices to develop and maintain a productive growing stock from which crops of wood may be taken as a regular part of the farm business" (page 9). "Careful study of the farming operations, however, will usually bring to light inefficiencies in building arrangements, barn layout, field arrangement, job sequences, or other practices. Stopping these leaks will maintain output with less labor" (page 13). "With the exception of the few operators who are too old or disabled, there is little question that farmers could substantially increase their woodland earnings by greater use of available time, labor and equipment" (page 13). "Furthermore, as wood will grow without close attention and can be stored on the stump, there is less time urgency in the management of the farm woodland than in the management of the other enterprises. Once farmers realize that a forest enterprise can be a profitable supplement to a dairying, more operators will divert labor to the farm woodlands" (page 14). "Authoritative information on relative earnings in forestry as compared to other farm enterprises is needed. Such evidence as is available indicate that labor income per hour in woods work compares favorably with other farm activities" (page 15). At the end is an appendix containing supplementary and explanatory material, helpful in understanding some of the principles used in making the study.

—John F. Preston

WATER SPREADING

(*Continued from page* 76)

that the spreader cost may equal the value of the land involved. In dry years the performance of spreaders sometimes fully justifies an outlay in excess of the value of the land. Earth-fill structures are usually cheaper than masonry or other types of structures, and for this reason have been most commonly used.

It must be kept in mind that there will be some maintenance required. After a spreader has operated a few times there are, too, usually some refinements and supplemental structures that suggest themselves. Allowance should be made for this additional investment expense in figuring the prospective costs.

The design of water spreading structures challenges the ingenuity of the planning technician and is a good example of the old adage that two heads are better than one. The technician and the rancher working together can produce a much better layout than either could do alone. The best water spreaders aren't built to a pattern. They are built to fit the ground.

REFERENCE LIST ☆☆

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SOIL CONSERVATION SERVICE

Bed-Load Transportation in Mountain Creek. SCS-TP-55. Soil Conservation Service. August 1944. Processed.

Cork Oak in the Southeast. SCS-TP-54. Soil Conservation Service. August 1944. Processed.

Fur from Farm Lands. Reprinted from Soil Conservation, Vol. IX, Nos. 11-12. Soil Conservation Service. May-June 1944.

Increasing Income through Range Conservation and Livestock Improvement. Regional Bulletin No. 93, Evaluation Series No. 3. Regional Office, Soil Conservation Service, Albuquerque, N. Mex. June 1944. Processed.

List of Publications and Reports on Sedimentation, January 1, 1935-August 1, 1944. Technical Letter Sed-15c. Soil Conservation Service. August 1944. Processed.

Planting Cork Oak on Farms in the Southeast. Soil Conservation Service. April 1944. Processed.

Progress in Determination of Conservation-Farming Needs, 1934-1944. War Food Administration, Soil Conservation Service. June 1944. Processed.

Raindrop Erosion Studies. Reprinted from Agricultural Engineering. Soil Conservation Service. August 1944. Processed.

Sedimentation in a Great Harbor. Reprinted from Soil Conservation, Vol. X, No. 1. Soil Conservation Service. July 1944. Processed.

Soil Conservation Districts, State of Organization by States, Approximate Acreage, Number of Operating Units and Farms in Organized Districts. Soil Conservation Service. August 1, 1944. mm.

OFFICE OF INFORMATION U. S. DEPARTMENT OF AGRICULTURE

Comparison of Native Grasses and Crested Wheatgrass and of Supplements for Beef Cattle in the Northern Great Plains. Circular No. 705. Bureau of Animal Industry, Agricultural Research Administration. August 1944.

Report of the Puerto Rico Experiment Station, 1943. Office of Experiment Stations, Agricultural Research Administration. 1944. 10¢. [1]

STATE BULLETINS

Annual Report of the Board of Control for the Fiscal Year Ending June 30, 1943. Agricultural Experiment Station, University of Nevada, Reno, Nev. 1944.

Association of Crops with Soils and Other Factors, Jefferson County, Tennessee. Rural Res. Ser. Monog. 169. Agricultural Experiment Station, Knoxville, Tenn. 1944.

Bacteria and Rural Water Supplies. Bulletin No. 414. Agricultural Experiment Station, Massachusetts State College, Amherst, Mass. June 1944.

Bimonthly Bulletin. Vol. XXIX, No. 229. Agricultural Experiment Station, Wooster, Ohio. July-August 1944.

The Chemical Composition of Forage Grasses from the Gulf Coast Prairie as Related to Soils and to Requirements for Range Cattle. Bulletin No. 644. Agricultural Experiment Station, Texas A. & M. College, College Station, Tex. January 1944.

Colorado Farm Bulletin. Vol. VI, No. 4. Bimonthly Publication of Agricultural Experiment Station, Colorado State College, Fort Collins, Colo. July-August 1944.

Crop Calendars for a Year-Round Pasture Program. Circular C-116. Agricultural Experiment Station, Oklahoma A. & M. College, Stillwater, Okla. July 1944.

Crop Standardization and the Production and Distribution of Pure Seed of Farm Crops in Montana. Circular No. 179. Agricultural Experiment Station, Montana State College, Bozeman, Mont. June 1944.

Land Utilization in Henry County: A Study of the Effect of Industrialization on Rural Land Utilization. Technical Bulletin No. 93. Agricultural Experiment Station, Virginia Polytechnic Institute, Blacksburg, Va. March 1944.

Run-off from Small Agricultural Areas of Dunmore Silt Loam and Related Soils in the Limestone Valleys and Upland Section in the Southeast. Technical Bulletin No. 90. Agricultural Experiment Station, Virginia Polytechnic Institute, Blacksburg, Va., with the cooperation of the Soil Conservation Service, U. S. Department of Agriculture. November 1943.

Small-Grain: Information from Experiments in Progress. Leaflet F. C. 17. Agricultural Experiment Station, Ames, Iowa. 1943. Processed.

Vitamins D and A in Alfalfa Hay. Circular No. 53. Agricultural Experiment Station, South Dakota State College, Brookings, S. Dak. June 1944.

Whitetop Eradication. Bulletin No. 170. Agricultural Experiment Station, University of Nevada, Reno, Nev., with the cooperation of the U. S. Department of Agriculture and the California Experiment Station. June 1944.

[1] From Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.

FARM FORESTRY TO RESCUE

(*Continued from page* 78)

million feet the redwood in Eureka Canyon. There is more farther west. Tindall also has brought a million feet of stumpage on the Arnold Baldwin property a couple of miles from his own farm. He plans to apply woodland conservation methods in cutting from this 640 acres of second growth redwood and tanbark oak.

"We can cut for years and years," he says. "They (the redwoods) come on fast. We could remove a million feet a year."

Tindall calls attention to the fact that one 58-year-old redwood yielded 1,500 feet of lumber. Tindall has some madrone, expects to find a market eventually for furniture.

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NOVEMBER 1944

SOIL CONSERVATION

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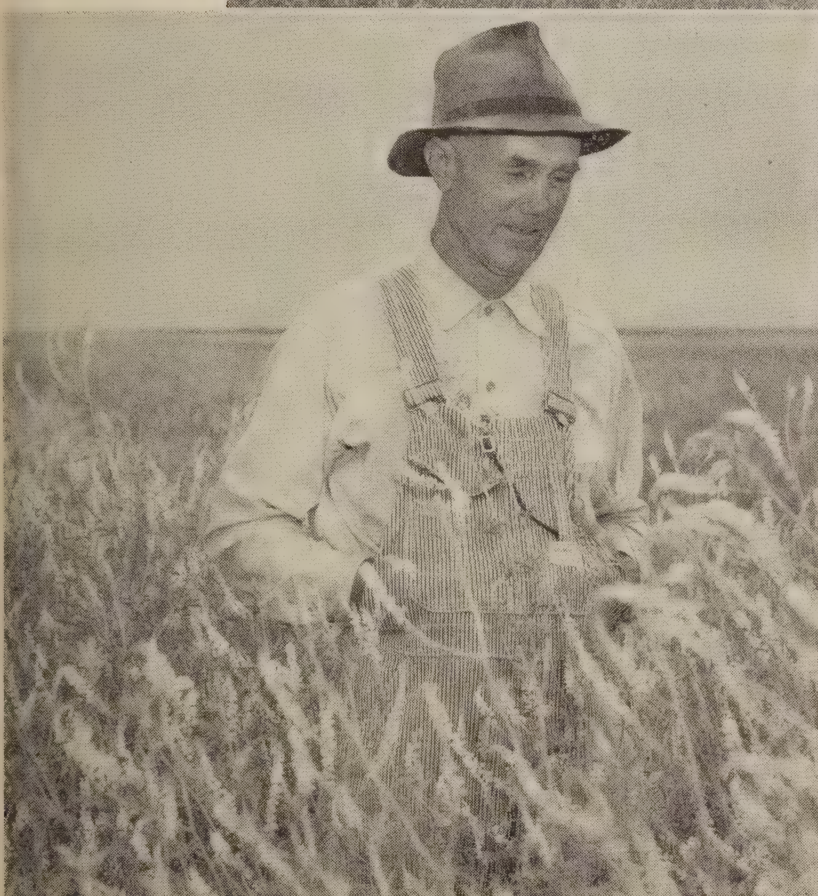
WELLINGTON BRINK EDITOR

CONTENTS

Front Cover: Miss Clare Eckles, lovely Georgia farm lass, seen also in pictures on page 95. Photographer: Barrington King.

SOIL CONSERVATION *is issued monthly by* SOIL CONSERVATION SERVICE of the United States Department of Agriculture, Washington, D. C. The matter contained herein is published by direction of the Secretary of Agriculture as administrative information required for proper transaction of the public business, with the approval of the Director of the Budget. SOIL CONSERVATION seeks to supply to workers of the Department of Agriculture engaged in soil conservation activities, information of special help to them in the performance of their duties. Copies may be obtained from the Superintendent of Documents, Government Printing Office, Washington 25, D. C., 10 cents a copy, or by subscription at the rate of $1.00 per year, domestic; $1.50 per year, foreign. Postage stamps, will not be accepted in payment.



Wallin stands in a field of hubam clover in full bloom.

In late May, after 49 days of grazing by 26 head of cattle and 50 sheep, hubam clover in this 8-acre field almost hides some of the cows. The pasture, it must be conceded, is a bit ahead of the cows, indicating that the grazing program may still be subject to revision. (Upper right)

Diversification comes to Texas Blackland

By GORDON WEBB

Jones Wallin finds soil conservation profitable on his 248 acres of blackland in Williamson County, Tex. Annual gross income (figured at 1935-37 prices) increased $1,799 in the years 1940-43. With the upsurge in prices, however, his gross income actually has risen from $3,196 to $7,469 annually. That's more than $17 an acre.

Wallin's books show that he is getting 40 bushels of corn where 20 used to grow, 250 pounds of lint cotton instead of 167 pounds, 40 bushels of milo as compared with 30 bushels, and 4 tons of non-legume hay where 3 formerly were harvested.

Editor's Note.—The author is in the regional division of information, Soil Conservation Service, Fort Worth, Tex.

Walk over his fields and you must agree with him that erosion has been controlled. When he developed a conservation farming plan in June 1938 with the help of Soil Conservation Service technicians at Pflugerville, erosion was active on all but 14 acres of his farm. Between 25 and 75 percent of the topsoil had washed from 189 acres. More land was going down the creek every year. With assistance, first from the Soil Conservation Service and more recently from the Taylor Soil Conservation District which he and other landowners organized, Wallin has established every planned practice.

This farm isn't tied to a cotton row any more. Where cotton once accounted for 81 percent of gross income, it now represents 54 percent because diversification has come with soil conservation. Wallin has reduced his cotton acreage 45 percent but total production has fallen only 18

percent because of higher yields. His farm now averages 39 percent more corn from 45 percent fewer acres. These acreage reductions in cotton and corn have enabled Wallin to plant more milo and hay, to add 36 acres of hubam clover, and to enlarge his pasture by 5 acres.

This Williamson County farmer always has fed home-grown feed to livestock, including 4 work animals. But before the adoption of a soil conservation program the annual income from livestock was $345 *less* than the value of feed fed on the farm. Now he received $732 a year *more* from livestock than the value of home-grown feed at today's prices. Before his conservation work he had 4 dairy cows, 100 chickens, and 6 hogs. Today he keeps an average of 6 dairy cows, 7 beef cows, 425 chickens, 15 hogs, 28 ewes, and 65 turkeys.

Wallin has converted weed-grown waste land along the branch into good, erosion-resisting pasture which has helped him to get into a livestock production program. This land was fenced and sodded to Bermuda grass. Sheep help to control the weeds.

Thirty acres of pasture before soil conservation provided only 108 animal unit months of grazing a year. "Animal unit month" is the term used to describe one month's grazing by one cow. Thirty-five acres now provide 600 animal unit months of grazing annually. Sudan and oats add 66 animal unit months of grazing each year. Both oats and sudan are new crops on this farm.

Good pastures have been the exception in the Blacklands largely because cotton or corn grew almost to the doorsteps. If a small creek or drain ran through the place, it was fenced and called pasture. Many "pastures" had been cultivated until they were too eroded to pay a profit in cotton or corn. These pastures, without soil conservation and management practices, are little better than what Texans call "stomp lots."

That's why a Blackland pasture growing enough forage on two acres for three cows, as Wallin's does, is outstanding.

Wallin's success with hubam clover is significant to farmers throughout the 11 million acres of the Texas Blacklands. Ten years ago one of the greatest needs of Blackland agriculture was a satisfactory legume to be included in a crop rotation. A legume was wanted that would survive cotton root rot, that would make a vigorous growth for green manure, that could be used for hay and grazing, and that would produce an abundant seed crop. Farmers are slow to grow big acreages of soil improving crops if they have to buy seed every year.

One of the several legumes tried by Soil Conservation Service technicians and farmers was hubam clover, an annual form of biennial white sweet clover.

Six years ago the Soil Conservation Service gave 60 pounds of this legume seed to Wallin because seed was still difficult to obtain. In 1943, one of his biggest cash crops was hubam clover seed. He harvested 300 pounds an acre from 36 acres, kept enough to plant 50 acres, and sold the remainder for $1,400. The price in his community last year was $13.50 per hundred pounds.

On this farm, hubam clover is cash crop, soil improvement crop, hay producer, and supplemental pasture.

Last year Wallin gathered 260 pounds more seed cotton following hubam. He also grew 53 bushels of corn an acre on land where the legume had been turned under as green manure. It was land that formerly produced 12 to 25 bushels an acre, and averaged 20. One year he measured corn yields following two methods of handling the clover. Where it was plowed under green, 48 bushels of corn an acre were harvested; where seed was taken and the stalks turned under, the yield was 40 bushels. Where no hubam had been grown, corn produced only 30 bushels. Many farmers take a hay crop early in the season, and a seed crop from the second growth. Wallin's hay production has averaged 3 tons an acre.

As to the grazing value, the Williamson County farmer pointed to an 8-acre field. He said 26 cattle and 50 sheep had been grazing there since the first of April 1944, or for 49 days, and the animals were still belly-deep in clover. Five dairy cows had doubled their milk production, and Wallin said he had bought another 10-gallon can to help hold the extra milk.

Hubam clover also improves soil conditions. Water is absorbed more readily and in greater quantities. Heavy clay soils become granulated, a highly desirable condition, and are much easier to plow when the legume is used in the rotation.

Work at the Texas Blackland Experiment Sub-Station at Temple, in Bell County attests the soil improvement value of hubam clover, and in two instances shows a remarkable reduction in root rot damage to cotton where the legume is included in a rotation. This fact is extremely important to Blackland farmers who may find 10 to 52 percent of their cotton plants dead of root rot by early September when hubam is not in the rota-

tion. The experiment station reported that in a rotation of cotton and hubam for seed 3.5 percent of the cotton had been killed by root rot in September, as compared with 27.2 percent in a cotton-corn rotation and 39.8 percent in continuous cotton. These figures are averages for the three years ending in 1943.

"In the past," the experiment station reported in December 1943, "it has been considered economically unsound for Blackland farmers to devote a crop year to the production of a soil building legume. In addition to producing as much cotton in one year as continuous cotton produced in two years, the hubam in the cotton-hubam rotation produced an average of 352 pounds of seed per acre, which sold for 14 cents per pound in 1943. In the rotation where the hubam was used for hay 1.62 tons per acre were produced. Hubam can also be grazed either in a mixture with small grain or alone."

In the northern half of the Blacklands hubam should be planted in early spring; in the southern half fall planting is best. Seed are ready for harvest in July.

On Wallin's farm a crop rotation featuring hubam clover is only one of the practices that have been combined to make a complete soil conservation program.

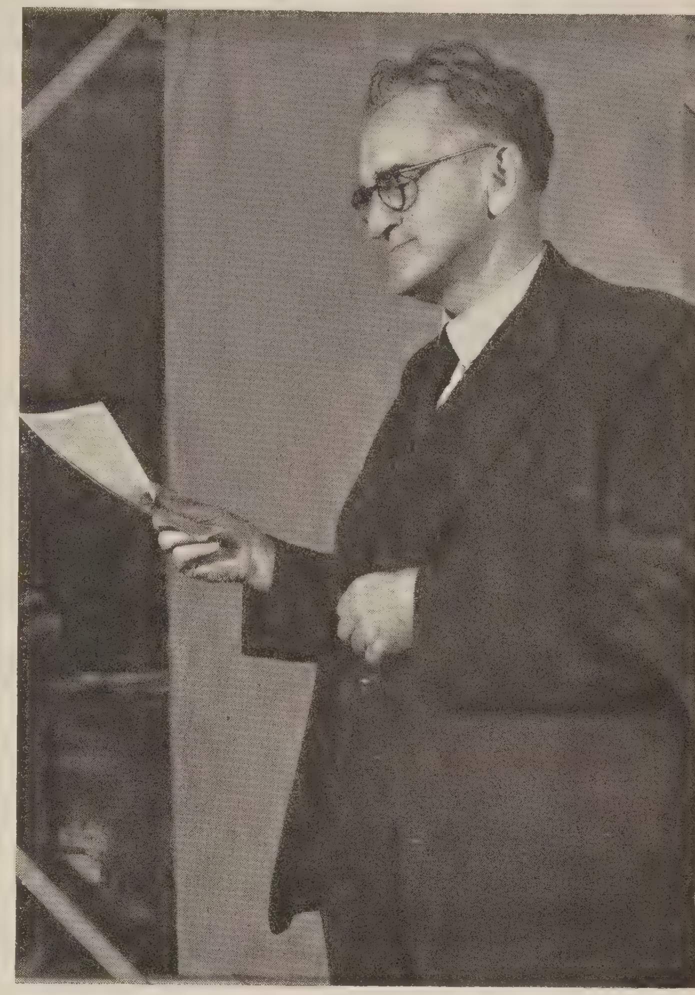
All the 211 acres cultivated are farmed on the contour. Wallin's complete terrace system includes a farm water course to receive terrace water without erosion damage.

Although Wallin's achievements are outstanding, he is not alone among Blackland farmers in gaining greater production and greater income through soil conservation farming methods. Recently the Soil Conservation Service received reports from farmers whose conservation plans had been 70 to 100 percent established for at least two years. In this group are 454 Blackland farmers who operate 72,700 acres in soil conservation districts.

Today these 454 men are growing an average of 21 percent more cotton an acre, 37 percent more corn, 27 percent more non-legume hay, 13 percent more grain sorghum, 16 percent more wheat, 46 percent more peas, 60 percent more onions. Livestock carrying capacity of their pastures is 37 percent greater an acre. They have 10 percent fewer acres in cultivation and 62 percent more acres in pastures. Where they had 2,475 idle acres they now have only 62—and their plans call for putting even this land to work.

(*Continued on page* 110)

Friend From Victoria



Among recent distinguished visitors from abroad is the Honorable Sir A. Louis Bussau, for the past 6½ years Agent General for Victoria at London.

Sir Louis, returning to Australia after his long sojourn in England, stopped off in Washington the latter part of September for a few days with Soil Conservation Service officials in preparation for stop-overs in Texas and California. Being a "man of the land" himself, a freeholder with extensive grain and livestock interests in Victoria, he is keenly interested in soil conservation achievements in former dust-bowl areas and on irrigated land. He is also impressed with the idea of soil conservation districts and with the progress districts are making everywhere in the United States.

Sir Louis was a member of the first committee appointed in his homeland to look into erosion problems, a committee which filed its report in 1930.

Sir Louis is here seen giving his attention to a picture of a Texas watershed now under complete soil conservation.

Eckles redesigns his farm

By BARRINGTON KING

W. F. Eckles thinks he's found the secret of successful farming on his 138-acre farm near Waco, Ga., in Haralson County. The principle is so simple that he wonders how he overlooked it so long.

For 23 years, Eckles has lived on the same farm in the southwestern part of Haralson County. He has always been known in that section as a good farmer. He terraced his cropland, planted and cultivated on the contour, rotated his crops. He rarely failed to make a bale of cotton to the acre, which is nothing for any farmer to complain about. But somehow Eckles had the feeling that he wasn't doing as good a job of farming as might be done with his land.

EDITOR'S NOTE.—The author is in the regional information division, Soil Conservation Service, Spartanburg, South Carolina.

Under consideration: a new border strip of perennial lespedeza sericea between field and woodland. W. F. Eckles, kneeling; Joe D. Tucker, district conservationist, at right.

That 7-acre field over back of the house, for instance, that he had quit cultivating because the land was washing badly and the yields were not large enough to give him an adequate return on labor, fertilizer, and seed; that 9-acre area of bottomland that was too wet to cultivate and had grown up to willows, alders, and other worthless growth; that 12 acres of upland pasture that just wouldn't produce enough grazing for his 4 milk cows and 3 mules during the hot, dry summer months—these were some of his problems.

Shortly after the West Georgia Soil Conservation District was organized in 1939 by farmers of Haralson, Herd, Douglas, and Carroll Counties, Eckles decided to see what the district could do toward working out a complete soil conservation plan for his farm. As the first step, a detailed soil conservation survey was made, showing soil type, steepness of slope, degree and extent of erosion, and existing land use on every portion. With this information, Eckles and a technician of the Soil Conservation Service assigned to the district went over the fields, one by one, to plan the most efficient use of every acre.

The 7-acre field of idle land that was too steep and erodible for row crops could be put to productive use by kudzu, a deep-rooted perennial legume that would provide high-quality hay, and supplemental grazing during the late summer and fall drought. The 10-acre upland pasture was covered with good Bermuda grass sod and annual lespedeza, but the grazing capacity could be increased by an application of lime and fertilizer and by seeding hop clover for earlier grazing in the spring. Sericea lespedeza also could be seeded on a part of the pasture as another early grazing plant.

Straw rides are part of the farm job, too. Whether there's hay to be hauled to the barn or land to be plowed with the tractor, Clare Eckles and her two sisters pitch in and help their father get the work done on time.

The survey information showed that the soil of the bottomland area that was too wet for cultivation would make excellent permanent pasture, if cleared of shrubby growth, fertilized and limed, and seeded to adapted pasture grasses, and legumes like Dallis grass, annual lespedeza, and white Dutch clover. A clear spring branch that flowed through the bottomland would provide water for cattle and other livestock.

On the cultivated land, existing terraces were found to be inadequate for handling the volume of water that ran off during heavy rains. So improved broad-channel terraces were planned, and to prevent surplus water from terraces from emptying on unprotected areas, new terrace lines were run so that the terraces would empty into natural draws or depressions. These natural drainageways were developed into broad meadow strips by seeding to sericea lespedeza, to protect the land from concentrated volumes of water from the terraces and to provide another source of perennial hay.

Strips of sericea were seeded also on steep, erodible slopes within cultivated fields and along the borders of fields and woodland, where shading by trees and competition with tree roots for plant

"It's going to be a fine yield of wheat." Sara Eckles at left, Clare at right, examine the ripening heads of grain with Jane League, a girl from a neighboring farm.

food and moisture made it unprofitable to plant cultivated crops. These woodland borders of sericea would provide cover for quail and other insect-eating birds adjacent to the cropland where they could easily range out into the fields.

The sericea planted in his meadow outlets for terraces and in strips on the steeper slopes in his cultivated fields now totals about 6 acres. From these areas Eckles harvests about 9 tons of perennial hay each year in 2 cuttings. The kudzu on the 7 acres of formerly idle land furnishes additional hay, and supplemental grazing during dry periods that reduce the production of his permanent pastures, especially in late summer and fall.

"Ordinarily, I'd be planting cowpeas for hay at this time of year," Eckles said in mid-June, "but I've already cut three-quarters of a ton of hay per acre from my sericea and I'll get another cutting of hay and a seed crop from a part of my sericea later in the year."

Eckles used to plant about seven acres of small grain and follow the grain with cowpeas for hay. Now he plants 22 acres of small grain, including 16 acres of oats and 6 acres of wheat, and sows lespedeza on the grain in late February or early March.

"When I used to plant cowpeas after my grain was harvested in June I'd have to plow the land for the peas and that took a lot of labor just when I was busy with other crops," Eckles explained. "Sometimes it would be too wet to plow, sometimes it would be too dry to sprout the peas. And some-

Sacking grain as it comes through the combine is part of the fun of living on a farm for Clare Eckles. She and her sisters drive the tractor and handle other farm equipment during rush periods.

times a heavy rain would come just after the land was plowed and wash away a lot of loose topsoil.

"With lespedeza, all I have to do is to walk over the grain field in the late winter or early spring and scatter the lespedeza seed on the grain," he continued. "By the time the grain is ready to harvest, the lespedeza is already on the job and it makes rapid growth after the grain is cut. Another advantage about lespedeza is that it gives better protection for the land over a longer period than cowpeas."

Eckles leaves a part of his lespedeza on the land to reseed a second year and harvests the rest for seed, letting the stubble and straw remain on the land through the winter for soil protection and soil improvement. He harvests as much of his second-year lespedeza as he needs for hay, again leaving the stubble on the land over winter, and plants the land to row crops the following spring.

Land that has been in lespedeza two years is dark and loamy and easy to plow, and soaks up water like a sponge during heavy rains, storing the water in the land instead of permitting it to run off and carry away valuable topsoil. The organic matter added by the lespedeza builds up fertility as well as increasing the water-holding capacity of the soil.

"Droughts don't bother me nearly as much as they do some of my neighbors," Eckles says. "Lots of times I'll get a good stand of cotton or corn on land that's been in lespedeza, while folks all around me will be planting over."

Eckles plants about 24 acres of corn each year, in addition to his oats, for livestock feed. He has cut his acreage of cotton considerably. Back in 1936, he was planting 23 acres of cotton and had a tenant on halves. Now, with most of his land in permanent hay crops, improved pasture, small

Once idle, eroded land now planted to kudzu. It provides good grazing on the Eckles farm when production of permanent pastures falls off during summer heat.

grain and lespedeza, he has reduced his cotton acreage and operates his entire farm without any outside help. Last year he planted 10 acres of cotton and this year he planted on 5 acres, which has materially reduced the labor formerly required for planting, cultivating, and picking.

At the same time, better land use and improved rotations have enabled Eckles to increase the per-acre yields of all crops. His average corn yields have been boosted from 15 to 25 bushels, oats from 25 to 55 bushels, and wheat from 10 to 20 bushels per acre. Last year he made twelve 500-pound bales of cotton on 10 acres.

Increased production of feed from 13 acres of perennial hay and from the increased acreages of improved pasture, small grain and lespedeza has enabled Eckles to increase his livestock. Since he started his conservation farming program 4 years ago, he has bought a purebed Aberdeen-Angus bull and 6 grade beef cows, and he is building up a herd of beef cattle. He has also increased his milk cows from 4 to 5. Counting yearlings and calves he now has 26 head of cattle.

The milk from the 5 milk cows is consumed in the home or used for raising calves, but he sells some surplus butter. Eckles has increased his poultry from 50 to 100 laying hens, and he raises 3 hogs each year for home use. Home-grown wheat is used for flour and for poultry and other livestock feed. He has a one-acre vegetable and truck garden that supplies the family with all the fresh vegetables they need and a surplus for sale.

In addition to the grain consumed on the farm, Eckles sells about $250 worth of wheat and oats and $400 worth of corn a year. He also sells about

$400 worth of sericea and annual lespedeza seed and seeds back about $200 worth of annual lespedeza seed each year on his own land. While saving the best heifer calves each year, he sells about $500 worth of steers, cows and veal and he expects to increase his livestock sales as his herd increases.

Since starting his conservation program 4 years ago, Eckles has bought a small tractor and a combine. He uses the tractor for breaking land and cultivating row crops, and hitches the combine to the tractor for harvesting his grain and his annual and sericea lespedeza seed.

Eckles hasn't any sons, but his three daughters operate the equipment and do other farm jobs as well as boys could. It's not a lark for them, because when there is land to be plowed or grain or hay to be cut, they pitch in and stick with the job until it's done. But they enjoy every minute of it.

Sixteen-year-old Charlotte and 15-year-old Sara learned to operate the tractor as soon as their father bought it. But Clare, now 13, wasn't permitted to run the machine until a year later, at 10. Eckles taught each daughter how to operate the equipment safely, and care for it properly.

Charlotte entered West Georgia College at Carollton in June. Eckles, the two younger girls, and Mr. Eckles' 84-year-old father do the work in the field, while Mrs. Eckles looks after the household duties, which include canning some 500 quarts of vegetables and fruit and about 350 pounds of dressed beef each year, with the help of the girls in their spare time.

All the members of the Eckles family work hard. But they live well. Farm jobs aren't a burden. The dark, loamy soil falling away from the plow in the spring, the bright green hay to be cut and the golden grain to be harvested in summer, the corn to be gathered when the cool days of autumn come—these are looked forward to with anticipation and tackled with the zest of healthful living.

"The farmer has been pictured too long as a rag-tag fellow, mining a bare living out of the soil because he doesn't know how to do anything else," Eckles says. "To my way of thinking, farming—if it's done right—is about the most interesting job there is. I may never make a fortune, but I'd rather farm than do any other kind of work."

That goes for the rest of the family too. They live the simple life, in daily contact with the sun and the rain, the air and the soil. They have found it good, and it has put the glow of health in their cheeks.

"Good livestock and machinery appeal to young people," Eckles says. "You can't expect them to get interested in the kind of farming that has nothing to offer but monotonous jobs of planting, chopping, and picking cotton year after year. But give them some livestock and machinery and they'll stay on the farm, instead of going off to get jobs in the mill."

Without adding a single acre to his farm, Eckles is building up a good herd of beef cattle, growing a wider variety of crops, developing new sources of income, improving the soil's fertility, and increasing crop yields, simply by using the soil resources he has more efficiently and setting up conservation measures to protect the land against erosion, in accordance with its capabilities and needs.

He has developed for improved permanent pasture the low-lying areas where moisture conditions are favorable for pasture grasses and legumes. He is producing virtually all the hay he needs from perennial hay crops of kudzu and sericea lespedeza on the steep, erodible areas not suitable for safe or profitable production of other crops. And he is growing his row crops in improved rotations on the more gently sloping areas of adapted soil types which are less susceptible to erosion.

"Good land use is the secret of successful farming," Eckles says. "Of course, you've got to have good terraces, good rotations, and apply lime and fertilizer, too. Those things are a part of using the land right. But if you don't put your row crops, your hay crops, and your pasture on the land where they ought to be, and use all your land for the crops it's adapted to grow, you're still going to find yourself going down hill."

Eckles is just one of more than 17,000 Georgia farmers who are carrying out programs of sound land use and conservation farming which they have developed with facilities available to them through the 21 local farmer-organized, farmer-operated soil conservation districts in the State. All these farmers are finding that conservation farming not only protects working capital but pays immediate dividends.

The old dream of diversified farming that people in the Land of Cotton have talked about so long is coming true in these soil conservation districts. It is coming about as a result of putting the South's diversified soils to their proper and diversified uses. That's what Eckles means when he says he's found the secret of successful farming on the ridges and hollows, the rolling land and branch bottoms on his Haralson County farm.

Otter Creek flood waters in spring of 1942, four miles south of Brandon, Vt.

"PRODUCTION INCREASES ARE STARTLING"

Thrilling reading to those who are friends of the American land is the saga of progress of many a soil conservation district. To my desk has come recently a simple "Report of the Otter Creek Soil Conservation District, July 2, 1941—December 31, 1943." It is an accounting to farmer members—nothing spectacular in tone or presentation, not written for consumption outside the district. It is merely one of many reviews periodically made to a district membership as an inventory of district business, problems and accomplishments. The Otter Creek Soil Conservation District is a legal sub-division of Vermont, one of more than 11 hundred soil conservation districts in the United States. From this report I take some excerpts for the insight they give into the workings of a typical up-to-its-job soil conservation district. I do so with acknowledgements to the five members of the district board of supervisors who sign the report: C. C. Seeley, Middlebury; John Kaldy, Jr., Florence; George Ash, New Haven; Walter Bryant, Shoreham, and Philip Eddy, Hinesburg.—THE EDITOR.

Originally, farmers were interested in forming the district to help them with community drainage problems on the LaPlatte River, Otter Creek, Little Otter Creek, and the land in the vicinity of the Shoreham Swamp. Many farmers also were interested in another community problem, the control of streambank erosion on valuable lowland fields lying adjacent to such mountain streams as the New Haven River, Cold River, Mill River and the Clarendon River.

After the district had been in operation a while, farmers (and the district supervisors who were elected to represent them and manage the affairs of the district) gradually became aware that the district offered possibilities for accomplishing other land use jobs not necessarily of a community nature, but nevertheless jobs which individual farmers have found difficult or impossible to complete with their own equipment and resources. Most of these jobs are of the type which requires detailed technical assistance for each farm, such as special advice and plans from agricultural engineers, agronomists, foresters or soils specialists, plus a need for machinery of the kind not usually owned by the farmer himself. There are several different types of such land improvement work needed throughout the district.

For instance, in the Champlain Valley the con-

struction and use of drainage or diversion ditches was essential to dry up the heavy clay soils in the spring and enable farmers to start spring work much earlier. In many parts of the district, field layouts and farm management plans need to be changed to increase production. Detailed surveys of each farm showing the soil, slope, amount of erosion and type of land use are now available to guide farmers and technical men working for the district in deciding exactly how fields should be managed.

About four-fifths of the land along Lake Champlain is open crop or pasture land where drainage and water disposal are very much needed and yet are often complicated and difficult to plan and construct. On much of the rolling cropland in this and other areas in the district, erosion is a serious problem. To meet it, farmers need detailed advice in contour farming, strip cropping and other erosion control measures.

The success or failure of dairying depends largely on the condition of the pastureland and the supply of water which is available. Particularly in the section along Lake Champlain, farmers are turning to the district for engineering assistance and the machinery necessary to construct farm ponds which will assure an adequate water supply for their dairy enterprises. In this and other sections also, pastures are run-out and covered with poverty grass. Through the assistance which the district can obtain from State and Federal agencies, we are trying to work out various methods to remedy this condition. In some places it is felt that the use of heavy harrows (perhaps of the bog harrow type) for preparing old pastures for reseeding will help in the solution of pasture problems. The construction of additional fences to divide pastures into two or more fields which can be grazed by the herd in rotation is another answer.

Outside of the Champlain Valley, woodland occupies from one-half to two-thirds of the land at the present time and its proper care and management can greatly increase the income of many land owners. Expert forestry assistance in cutting and marketing is needed on many farms before this can be done, however. Timber production can be greatly increased through such assistance and will also assure proper stocking of sugar orchards and prolong the lives of existing trees. Among other problems of woodland management are fencing out of woodland pasture, thinning, selective cutting and the sale of mature trees where not needed for sugar production. Throughout the district, farmers also need to make small plantings of black locust to provide a ready source of fence posts for use on the farm.

Aerial photographs for the entire district have been made available to the supervisors by the Soil Conservation Service under the terms of a written understanding. In accordance with the memorandum, the Soil Conservation Service has also provided detailed ground surveys showing soil type, degree of slope, amount of erosion and land use capability for farms of District cooperators.

With the aid of the photographs and the detailed surveys, the Soil Conservation Service technical men detailed to assist the district have worked out complete soil conservation plans for the fields and woodlands of 164 farmers who have requested such assistance with 111 of the plans being made last year. The 164 farms cover 38,760 acres. Up to the present, a total of 80 additional farmers have applied for similar assistance.

Included in the actual field work done so far to put these soil conservation plans into effect is a total of 18,270 linear feet of farm drainage ditches constructed, with 68,000 feet yet to be finished. In the Hinesburg section, nearly 2½ miles of a large community drainage channel has been excavated as well. Only 1½ miles of this excavation remains to be completed. This has already benefited 300 acres of land.

In addition, 16,150 linear feet of water-diversion ditches have been completed on hillside fields out of a total 133,120 feet agreed upon by farmers and the district. Nearly a thousand acres of sloping crop fields have been laid out and farmed on the contour to help prevent erosion. Four farm ponds have been completed in the past year out of a total of thirty-four called for in agreements. More than 1,000 acres of pasture have been improved by fencing, obstruction removal and the use of lime and fertilizer. Woodland management plans have already been carried out on 569 acres out of a total of 6,624 acres agreed upon. A total of 2,448 rods of new fence has been constructed.

Such practices as strip cropping, hedgerow removal, sod waterways, streambank protection, spring development, tree planting and several others have also been put into effect on a number of farms. Altogether, conservation methods have been put into effect on 19,707 acres of land out of the total of 38,760 acres on the 164 farms already under agreement.

Results so far from the use of contour farming, strip cropping and diversion ditches show that average yields of grain increase about 15 percent per acre, silage corn 20 percent and hay about 20

percent, due to the saving of soil and moisture, and the longer growing season possible when the ditches dry up the land earlier in the spring. Of course, yield increases will vary from farm to farm. Fuel savings range from 10 to 25 percent on contour-farmed hill fields, it is reported, because all work is done on the level—across the slope—instead of up and down hill.

The production increases from drainage are much more startling. Even partial excavation of the LaPlatte river community drainage ditch in the vicinity of Hinesburg will result in making 780 acres of valuable low-lying land available for hay crops during 1944. This land formerly was idle because it was too wet to be used. Furthermore, some 300 acres of land formerly too wet for any crop but hay can be used for grain and corn during and after 1944. The cost to landowners for this improvement of their land by the community ditch varied between $3 to $10 an acre, depending on the benefit they derived.

Due to the present shortages of machinery, equipment and materials as well as the fact that skilled technical help is scarce and ordinary labor almost unobtainable, much work which should be done in the district will have to wait until after the war is over. In the meantime, of course, the district supervisors are pushing the kinds of work which bring the quickest returns in increased production and can be done with the materials, equipment and technical assistance that is available.

At present, the district has on hand the following equipment:

one 50 hp. caterpillar tractor
two small graders
one 3/8 yd. dragline excavator
one 3/4 yd. dragline excavator
one 5-ton dump truck and trailer

The equipment now on hand is inadequate even to keep up with present work scheduled. At the present time, there is enough work planned to keep the tractor and small dragline busy for two years. The tractor is rather old and is quite inadequate for much of the work in the district. The small dragline will largely be used in 1944 to excavate ponds or small drainage ditches on individual farms while the large machine will be used exclusively to complete excavation on the community drainage ditch in the Hinesburg area and on lateral ditches necessary on adjacent farms. The 5-ton dump truck is inadequate to move much of this heavy equipment in rolling country.

In order for the district to operate efficiently in the near future, it will be necessary to secure the use of at least four tractors and bulldozers and additional trucks for towing the equipment. Additional machinery necessary after the war will include power shovels, a pile driver, bulldozers, dump trucks, caterpillar tractors, a scraper, an air compressor and a larger dragline. It is estimated, for instance, that the earth-moving work requiring a bulldozer would take one bulldozer working for more than 100 seasons, figuring that 800 hours work could be done in each season.

Several state, local and federal agencies gave valuable assistance to the supervisors in carrying out their program of work in the district. The Soil Conservation Service loaned or granted several pieces of heavy equipment and were able to make available a limited amount of trees, shrubs and seed of the kinds not locally available. Most important, they detailed four technical men to work full-time in the district and loaned the service of an engineer to help plan the Hinesburg drainage job. The county agricultural agents of Addison, Chittenden and Rutland Counties have given valuable help in holding educational meetings among farmers and arranging for tours and demonstrations. Some of the money for the Hinesburg drainage job was furnished to farmers by the local Production Credit Association and some of the towns loaned equipment to the district supervisors from time to time. The University of Vermont Agricultural College, including the Experiment Station and the Extension Service, has been extremely helpful in developing a pasture improvement program to help meet the troublesome grazing situation. Vo-Ag students and the schools in several towns engaged in specific conservation projects in their classes.

The State Highway Department gave the supervisors valuable help in completing the Hinesburg drainage project and farm foresters employed by the State and Federal Forestry Departments have given assistance to district farmers on woodlot management problems at the request of the district supervisors. The State Fish and Game Commission also rendered much assistance and advice in drainage and wildlife conservation.

"Poor soils make poor people and poor people make poorer soils. To have fertile soils we must add vegetable matter, lime, phosphate and potash to the soil in sufficient quantities to make it productive."—From a resolution passed by the board of supervisors, East Alabama Soil Conservation District.

Selective cutting on Cowlitz Project

Only 50 years ago this tract was a cultivated field. Today it yields 85- to 100-foot piling under selective cutting. It is on the Stewart Bush farm in the Cowlitz Farm Forestry Project, near Kelso, Wash. Bonneville right-of-way in foreground.

EDITOR'S NOTE.—The authors are respectively, head, current information, Soil Conservation Service, Portland, Oreg., and project forester, Cowlitz Farm Forestry Demonstration Project, Kelso, Wash.

By FRANK B. HARPER and MAURICE C. BONNEY

The Cowlitz Farm Forestry Project, taking in nearly 270,000 acres in western and southern Cowlitz County, Wash., started in November 1941. Just about that time Max Dercum, forestry graduate of Cornell with one year postgraduate work at the University of California, found him-

self in western Washington bent upon becoming a "dirt" forester. Attracted by the mighty sawmill production in the Longview-Kelso locality and by Cowlitz County's large volume of second growth Douglas fir, he stayed.

Stewart Bush, Dercum's teammate in the operation of logging equipment, is by contrast a farmer who lives on the place his father homesteaded in Hazelldell Valley about 8 miles north of Longview. It is on this farm that the two did their first cooperative cutting. They got out logs and piling under the best conservation methods for the war markets. Working closely with them in adapting methods of logging to the practice of forestry in second-growth Douglas fir is the project forester of the Soil Conservation Service, who is in charge of the project's administration.

The story of how the forester-farmer partners operated in Bush's own woodland reflects the problems and opportunities for profitable harvest of war-needed farm timber without needless slaughter of trees and without exposing the ground beneath to run-off and erosion. Though Bush is interested first in his herd of purebred Herefords—"don't call them 'whitefaces'"— 185 acres of his 240 acre farm is in woodland, timber that for the most part he has watched grow to saw size in his own lifetime.

"That woodlot up there where these pilings came from was just a clearing in my time and was farmed about 50 years ago," Bush recalled as he watched Dercum and hook-tender Frank Armstrong bring two 85-foot pilings into the landing with a tractor equipped with winch and dozer blade. "That piling is about 45 years old."

"This place is still referred to by old-timers as 'Burnt Hills', because a big forest fire went through here. The old stumps show there once was quite a stand of old-growth Douglas fir and cedar. This was all largely bare when my father moved up there from Coffin Rock on Cowlitz Flats in the big flood of '68, to have a place for his cattle. All this timber you see has come in as natural second growth. That slope there was all slashed and burned for pastureland in 1913, too, and was as clean as that power line clearing; and now you see that dense growth of fir."

The mud-chinked log cabin which stands between the old Bush house and the barn was on the homestead when the elder Bush, who died in 1928, took it up.

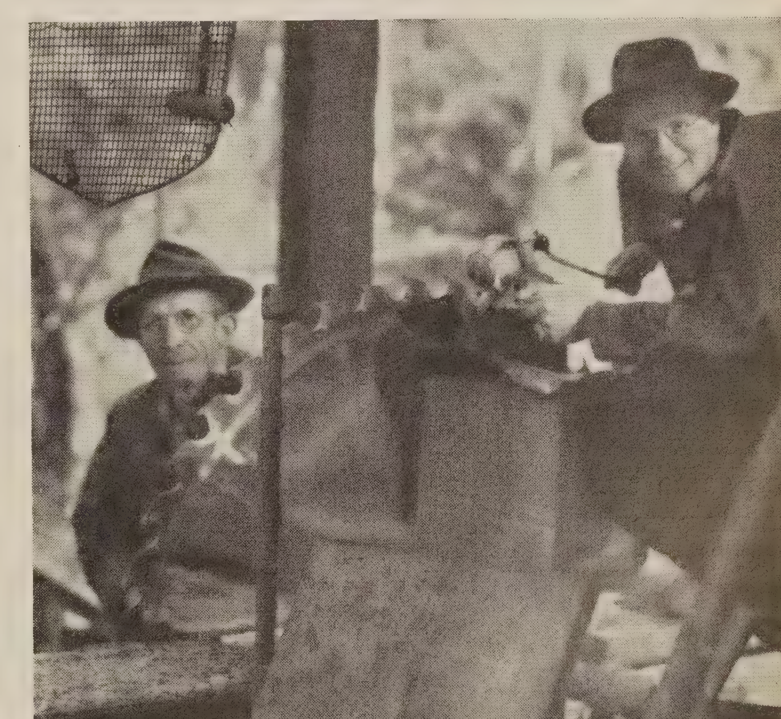
"We have the timber here," Bush said, "and I've always been thinking about getting something out of it. But when you sell to an operator who logs in the customary way, about all you have left after the little you get for the stumpage is waste timber on the ground, and your place all torn up. The way we are doing it now gives the farmer a chance to get his own labor into it and to get more nearly the real value out of his timber.

"We're making a selective cut in the stand," he added with obvious satisfaction, after calling attention to the dense stand on the formerly cultivated land. "We're taking around 3,700 linear feet of piling from about 10 acres. There is a lot more in there, but we are taking only the trees which will make this particular order."

Dercum pointed out that the piling had to meet size specifications and had to be straight, and that in cutting 46-to-100-foot piling the trees had been selected that would make the required piece without unnecessary waste in long butts.

The piling operations were of a fill-in nature, "taking up slack" for the major activity, as Dercum expressed it, while waiting for saw repairs for a small sawmill set up across the lane to turn the sawlogs into ties. As Bush pointed out, virtually none of the second growth had been taken off until recent years since his father followed the custom of other pioneers in the '70's and took off dead cedar for shingles. He remarked unenthusiastically that he also "tried selling a little stumpage."

Acknowledging the project forester's assistance, Dercum explained how he and Bush had pooled their funds to buy the equipment for this essential cooperative logging project, equipment that could



Partners in conservation logging: Farmer Stewart Bush and "Dirt Forester" Max Dercum.

not have been financed or have commanded priorities on an individual basis.

"Of course," the partners agreed, "we could just have made logs and trucked them out to other mills. Or we could simply have put them in the water. But we couldn't have utilized the timber so closely nor so profitably and left any trees standing for a second cut a few years hence. However, with the mill on the ground we can afford to utilize closely; we get the benefit of a short log scale, while logging the trees in long log lengths. We also get the benefit of whatever over-run there is in the cut of ties at the mill. Both slabs and sawdust are utilized since they are sold to buyers who remove the material from the mill and in turn dispose of it as fuel in Kelso and Longview. We truck the ties to the delivering point with the farm truck, which also adds to the total income from woodland."

The cut on this particular operation was figured roughly at a million board feet. Bush hastened to explain that, "We're going to have timber left when we get through with the cutting."

To this Dercum added, "Ordinarily the mill man buys the farmer's stumpage. We, however, retain ownership of the timber till it reaches the market. Under the conventional method of selling stumpage the only choice the farmer has was to turn his timberland over to the buyer and hope for the best. This way the owner retains control of his property by having the trees marked which he is willing to have cut, and both farmer and buyer are inclined to take more interest in making the thing go, for everything is on a more business-like basis. I see a real opportunity to demonstrate better cutting practices in second-growth Douglas fir through operations of this kind by lining up farm timber owners who are interested in the conservation of their timber. *The success of the whole approach hinges on the owner's willingness to make his timber accessible by paying the cost of building the necessary truck roads for logging selectively.* Otherwise, the operator must build the roads, which has the effect of immediately increasing the value of the farmer's timber and at the same time putting the owner in a poor bargaining position. The latter has no right to expect the operator to agree to a limitation of the trees to be cut from the stand. In other words, the stumpage owner has been following the practice for years of trading the future value of his stand of timber for a road which turns out to be valueless to him after the logging has taken place.

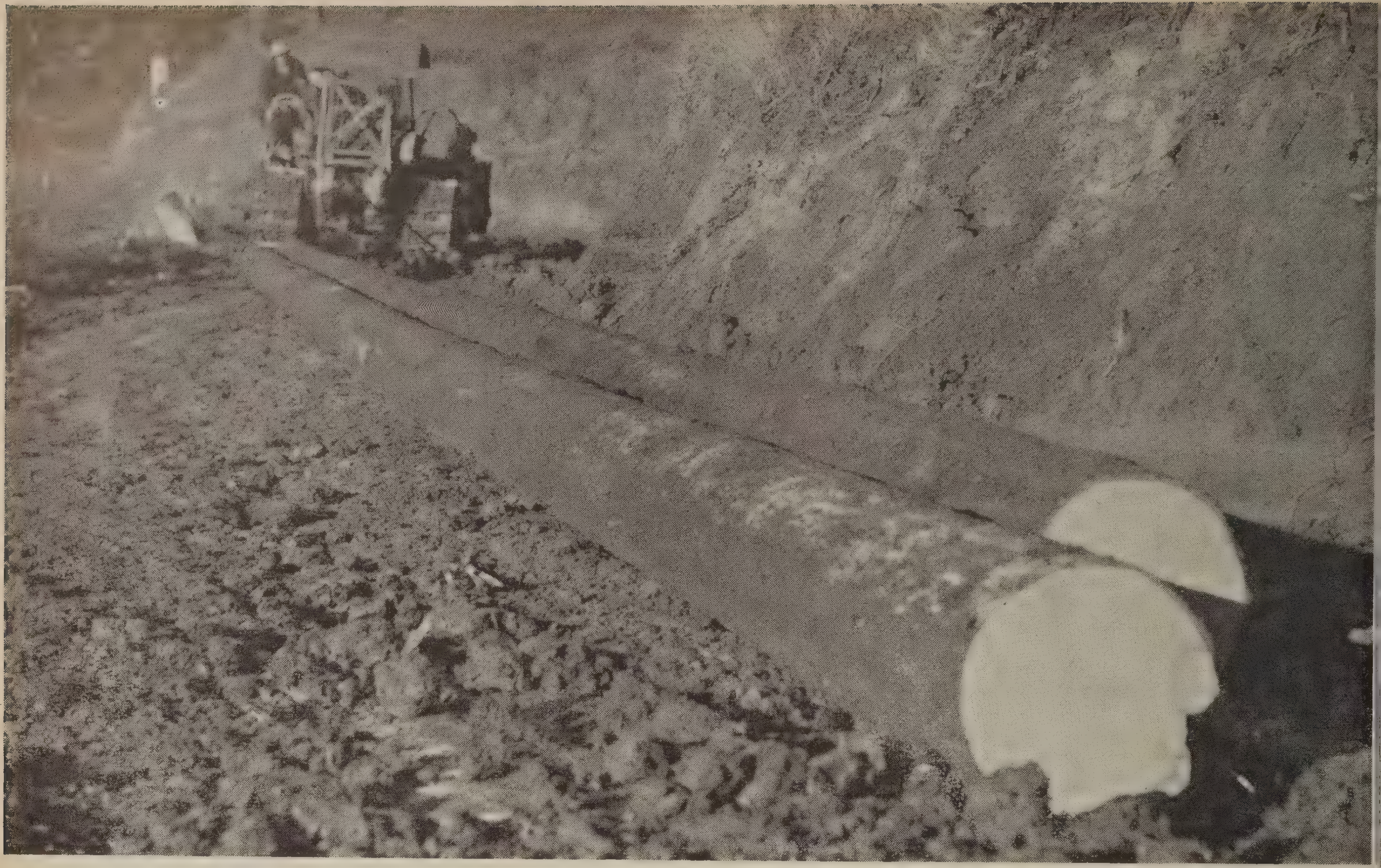
The farm forestry project is designed to put a stop to destructive scenes like this. Here's what happened when a 45-year-old stand of Douglas fir was clear-cut by donkey and spar tree at the very time Bush and Dercum were harvesting piling and tie logs without waste a few miles away. Probably one out of 20 trees in this stand were of merchantable size, but virtually all trees in a 10-acre tract were broken down by high-lead logging.

"When both the owner and the logger are interested, it is a good arrangement. It has to be a long-term affair and more than an experimental type of operation, for even the second-growth stands are becoming pretty well cut over. It is important for the owner to make it his business to know when and how much timber should be harvested to keep the stands in production."

This is something of "a new wrinkle" in the smaller West Coast timber operations. Dercum and Bush probably made a clearer statement of the case from the forestry and soil conservation standpoints than could the project forester himself.

Too often in the past the small woodland owner never has had logging operators available with the interest of the timber stand or of the land at heart. This kind of operation tends to point the way for both profitable and good forestry practice on West Coast lands. More owners are becoming interested in their woodland, are beginning to dictate which trees they are willing to sell and which ones must be left in good condition for future growth.

"We're going to find out a lot about what can be done on the business end of the enterprise, by keeping complete cost records," says Dercum. "This enables us to arrive at the most efficient methods for this type of logging. So far there seems to be no reason to doubt the practicability of cutting second-growth Douglas fir in such a way as to permit a number of subsequent cuts on the same area. We are now acquiring a light logging arch suitable for handling second-growth logs which should make it possible to yard much more efficiently and at the same time keep our roads in better shape. The addition of this piece of equipment should provide us with a flexible and complete outfit for meeting the forestry needs of other woodland owners in the farm forestry project. Aside from the tractor and arch, we have a dual-wheel, single axle, flat-bed trailer which facilitates the moving of the tractor so that small jobs of yarding and road-building can be accepted; and, a 2-ton logging truck, and single axle trailer suitable for hauling logs up to 32 feet long."



Some of the Bush piling, straight and cut to size, on its way to the landing.

Dercum's first venture into the local cooperative logging field was on the Henry E. Bodine place, before he and Bush procured the new, up-to-date tractor. The cut and selling figures boiled down to $1,150 which the farm timber owner took in on an operation that would have brought him only $253 if he had sold the same timber as stumpage.

The Cowlitz Farm Forestry project has 103,000 acres in small, private holdings with fairly large woodlands of mostly second-growth Douglas fir. The 1,900 farms in the project area comprise 112,000 acres, of which 70 to 77 percent is in woods. The entire area was cut over 40 to 50 years ago, in the days of oxen and greased skid, but there has been good natural restocking.

One of the main problems complained of has been "gyppo" logging along the highways. This is on the increase in recent years, with much of the stumpage sacrificed at less than the true value to the owner and at the additional cost of windthrow and fire hazards.

The object of the cooperative farm forestry project is good land use. Emphasis is on intensive woodland management on individual farms: "Develop to its sustained maximum the contribution which farm woods make to the economy, comfort and permanence of the farm as a whole." That is why the project's program is concerned, as well, with erosion control and related conservation problems on dairy farms in the valleys and the cut-over hilly lands.

The genuine cooperative feature of the project, aside from such working examples as the Bush-Dercum partnership, is indicated in the contributions by local, state and federal groups, such as the Washington State College Department of Forestry, farmers themselves, and the county commissioners, who furnish supplies, office space in the court house, and other services. Also cooperating are County Agent Claude S. Anderson, the Cowlitz County Forestry Education Committee, the State Fish and Game Department, the Bureau of Agricultural Economics, the AAA and the Farm Security Administration.

The State Agricultural Experiment Station is the state agency responsible for farm forestry research particularly respecting cooperative marketing and pooling, the value of products, the probable economic returns, and the growing and harvesting of cascara, Christmas trees and the like.

The State Department of Conservation and Developments cooperates through the local fire warden, Ammon Beede; and the U. S. Forest Service is authority for forestry subject matter and for farm forestry research through the Pacific Northwest Forest and Range Experiment Station. The Soil Conservation Service administers the project, handles farm planning, and provides project personnel and some equipment.

The farm forestry program for the state was drawn up in December 1939 by the State Farm Forestry Sub-committee and the State Land Use Planning Committee. Cowlitz County was selected as the first priority for such a project the next spring, because of such considerations as roads to markets, climatic and other conditions, the numerous farmer-owned woodlands and so on.

Though the primary aim of the project is to demonstrate and encourage widespread adoption of better cutting practices, using the owners' own labor and treating the farm woodland as a permanent, income-producing "crop", a plan is worked up for each entire farm, based on the ability of the land to produce this or that crop, according to its soil type, slope, erodibility and other factors.

Other farm forestry demonstration projects on the West Coast whose activities are being followed with interest by small private and large commercial timber interests alike are: Sonoma, Sebastapol, Calif.; Eldorado, Placerville, Calif.; Kootenai, Coeur d'Alene, Idaho; and Clackamas, Oregon City, Oregon.

Proud is Bush of his Herefords. His calf crop is close to 100 per cent. He figures on running about 25 breeding cows.

FARM FORESTRY BUILDS A NEW CANNERY

By A. C. McINTYRE

When, in December 1942, a disastrous fire struck a canning company's plant at Biglerville, Pa., the phoenix-like rise of a new plant from the ashes of the old one was made possible because two years before the Soil Conservation Service and the Pennsylvania Department of Forests and Waters had jointly inaugurated a farm forestry project in Adams county.

The apparently unrelated and unusual chain of events which lead to the rebuilding of the cannery was actually not unusual, but rather typical of the services of the farm forestry project to farmers and wood-using industries in the county.

The president of the company, I. Z. Musselman, has for some years been assembling a large acreage, most of which he has kept in orchards and woodland. In 1941, D. E. Hess, farm forester of the Adams county project, approached Musselman and pointed out the advantages of planting orchards on the contour and of developing a program of good woodland management. The latter, Hess showed, not only would make the best possible use of the woodland resources but would also make it possible to employ many key laborers from the company who were not needed except during the canning season.

Editor's Note.—The author is regional forester, Soil Conservation Service, Upper Darby, Pa.

Musselman, Hess, two other officials of the company, and the farm superintendent, made an inspection of three orchards in Adams county where the trees had been planted on the contour. Eventually, Musselman asked the Soil Conservation Service to lay out 34 acres of cherry orchard on the contour. This was in the fall of 1941. The following fall, 91 acres of apple orchard were laid out similarly.

By then Musselman's holdings also included 300 acres of woodland. An active woodland management program had not yet gotten under way because available labor was needed for clearing brush, pruning and improving the various orchards. In the fall of 1942 an inventory of the woodland was made in cooperation with the Pennsylvania Department of Forests and Waters, which furnished two foresters for the work.

This inventory had barely been completed when, on December 3, 1942 fire destroyed practically all of the buildings and equipment of the canning company, valued at from $175,000 to $200,000. The company officials made arrangements with another cannery to handle their 1943 production, but they were at a loss to know how to rebuild the plant. They had in mind steel and concrete, materials which probably could not be obtained until after the war. At this point Farm Forester Hess suggested that they consider a plant of wood construction. He pointed out that not only could wood materials be obtained, but that these probably could be had in large part from the company's woodland tracts. In short, he suggested rebuilding with lumber, trusses and other timber cut from the firm's own trees.

The company consulted an architect and a construction company specializing in wood construction. Favorable reports were forthcoming. Next problem was to get a sawmill operator who would in effect "custom saw" the Musselman wood tracts. When this proved impossible, Hess suggested that the company purchase a sawmill and do its own sawing. This idea met with favor, and permission to purchase a mill was asked of the War Production Board. The application was accompanied by a statement from the farm forester showing that the entire 300 acres of woodland would be harvested selectively and that all material not used in construction of the cannery would be sold to wood-using industries working on war orders. The War Production Board approved the application in May 1943 and the mill was delivered and set up during the first week of July. Meanwhile, the problem of a sawyer was solved when a part-time employee of the company, who had operated a sawmill for 20 years, agreed to do the work.

Hess marked the first 50,000 board feet of standing timber for cutting, and the sawmill got busy, with one of Musselman's tractors furnishing the power.

Two new problems immediately arose. First, a log wagon was needed for the heavy timber. This problem was solved by borrowing a wagon from another sawmill operator for long enough to get the largest timber out. Later, at the farm forester's suggestion, the chassis of an old truck was adapted to the purpose.

The second problem was to organize an efficient logging crew. Of 15 men available, only two had had any previous logging and sawmill experience. The value of training this inexperienced but willing crew is shown by the reduction in production costs from $35 or $40 per thousand board feet, during the first two weeks of operations, to an ultimate $18 per thousand for cutting, logging, sawing and stacking. Stacking of the lumber for seasoning also required close supervision by the farm forester, but proved well worth while. Some of the lumber was seasoned for 8 or 9 months, and the building contractor expressed his satisfaction at having seasoned material with which to work.

Sawmill and wood harvesting activities were carried on alternately with the orchard and canning operations during the fall of 1943 and the winter and spring of 1944. The farm forester, meanwhile, had marked for cutting the trees on the remaining areas. To date 255,000 board feet of lumber have been sawed. Of this, 203,000 board feet have gone into the construction of the plant. A further 10,500 feet went into 300 ties which were used for a railroad siding to the plant.

The company plans to build a warehouse later, and as soon as definite plans are made and the bill of materials calculated, the necessary lumber will be sawed and stacked for future construction. After the lumbering operations are completed, it is planned that pulpwood and fuelwood cutting will be systematically carried out, so that from then on, the woodlands will be harvested on a sustained-yield basis. In addition to the lumber used by the cannery, 41,500 board feet of lumber valued at $2,150 have been sold to defense industries. Furthermore, 200 cords of slabwood and topwood have been sold for $1,075.

When Farm Forester Hess asked Musselman the value of the lumber used so far, the company official replied: "In the first place, I have no idea where I could have purchased this lumber, and if it could have been bought, it very likely would

have cost from $90 to $110 per thousand board feet. My records show that the lumber actually cost approximately $25 per thousand board feet, exclusive of stumpage value."

The markets for the material not used in plant construction were found by the farm forester. This assistance in obtaining a market, like the other services which the Adams County farm forestry project has extended to the canning company, is available to any farmer in the county. Such assistance and technical guidance in selecting trees to be cut and other steps in good woodland management have already been given to nearly 100 Adams county farmers, and it is expected that this figure will eventually be doubled. Woodland management plans prepared by the project range in size from a few acres to several hundred. In the three year 1941-43 harvesting of woodland products on cooperating farms brought a gross income of $45,165. The average net income from woodland products for the year 1943 on cooperating farms where harvesting took place during that year was $181. This return in actual dollars and cents proves that intensive forestry management is a profitable proposition. In fact, the experience of farmers who have been helped by the Adams county project indicates that if the services of the project were not available, it might well pay them to hire a professional farm forester.

The Adams county project is not only helping farmers and others to realize a considerable immediate return from their woodland, but equally important, its advice and assistance in all phases of good woodland management will make it possible for farmers in the county to secure a continuing and profitable harvest of timber year after year.

Hardly less important is the fact that any farmer who wishes can also have prepared through the project a complete soil conservation plan for his entire farm. Musselman's contoured orchards are just one example of this. He now owns nearly 1,000 acres of orchard, of which more than 250 acres are planted on the contour. As the older square-planted orchards are taken out, they too will be replaced by contour plantings. On other cooperating farms, conservation practices such as contour strip cropping, good pasture management, and the use of diversion ditches and terraces are being adopted side by side with the farm's woodland management program.

CONTRACTORS DISCOVER SOIL CONSERVATION DISTRICTS

By A. E. McCLYMONDS

Private contractors have discovered soil conservation districts in the Northern Great Plains Region as a medium to enable them to do relatively small jobs on individual farms at reasonable prices and still produce reasonable earnings.

The first private contract in this region was let by the supervisors of the Brule-Buffalo soil conservation district in central South Dakota for the construction of a specified number of stock water dams. The supervisors made arrangements with the local bank so that cooperators could finance construction, and required deposit of the full estimated cost before work was begun. The contractor received 80 percent of the cost as each dam was finished and accepted by the district, and the remainder when the contract was completed. That was three years ago. The plan still works.

Other districts followed suit and today more than a score deal with private contractors. The Mouse River soil conservation district in North Dakota contracted for enough dugouts to warrant moving a drag-line in, whereas individually no single unit could have financed such work. In the Franklin County soil conservation district in Kansas, surface drainage jobs on cooperators' farms are done by a contractor, who in turn, when approached by individuals, asks farmers to have a conservation plan made first. This spring, the Box Elder soil conservation district in southwestern Montana advertised for the moving of 200,000 yeards of earth, and has since let the contract.

Contractor associations are interested. In South Dakota a resolution was adotped urging contractors to cooperate with soil conseravtion districts. The Nebraska association's secretary keeps contractors posted on district opportunities. This spring the Wyoming association listened to one who had worked with a district, and asked for more information.

The Wyoming contractor pointed out that cooperation with soil conservation districts is advantageous because it will give a longer period of use for equipment and a more steady income, con-

Editor's Note.—The author is regional conservator, Soil Conservation Service, Lincoln, Neb.

trasted with large earnings for a short period and then idleness and no income for the rest of the time.

Contracting construction work also frees the technicians' hands so that full time can be spent on farm planning and getting conservation practices on the land. Supervisors have commented on this especially.

Farm Pond Fights Fire

By MELVIN BLISH

Any farm pond which is near a building is a potential piece of fire fighting equipment, even though it is primarily intended for other purposes, such as stock water, fish production or recreation. This extra protective value which a farm pond can offer was strikingly demonstrated on a York County, Pa., farm this summer. Master farmer James K. Rishel, of Glen Rock, had the fortunate experience of seeing his farm pond completed ahead of schedule and just in time to supply firemen with the water needed to save his home and several other buildings from destruction.

When Rishel first discussed the possibility of constructing a pond with technicians of the York Soil Conservation District, he had particularly in mind fish production and recreation. The district prepared the plan for the pond and agreed to supply fish for stocking it. Rishel employed a private contractor to construct the dam. The contractor, happily, contrived to finish the work about a month ahead of schedule. A short time later, fire broke out at night in the barn. The best efforts of two fire companies could not save the barn or a nearby granary. But, because they had an unfailing supply of water to draw on, the fire was kept from spreading to the Rishel homestead and other buildings. After five hours of steady pumping, the level of the 400 x100 foot pound was lowered only six inches.

Rishel became a cooperator of the York District in January 1940, and has since installed a large proportion of the conservation practices called for in his farm plan. To the contour strips, the tile drains, improved pasture and woodland which help make up his soil conservation pattern can now be added the farm pond which already "has more than paid for itself."

EDITOR'S NOTE.—The author is district conservationist, York (Pa.) Soil Conservation District.

"Fertile soils produce prosperous citizenship in any community, county, state or nation.—Board of supervisors, East Alabama Soil Conservation District.

(Continued from page 93)

To use the bigger and better pastures and the greater amount of feed and hay grown, the farmers have increased their livestock: 48 percent more dairy cows; 173 percent more beef cows; 132 percent more brood sows; 65 percent more chickens; 201 percent more ewes.

Averaging production from crop and grazing land, the increase is 28 percent. In effect the 454 conservation farmers have added the production of 28 percent more acres, without buying another foot of land.

Applied to the 11 million acres of the Blacklands, this would mean the equivalent of production from 3,111,360 extra acres—or the enlargement of each 160-acre farm to the productive capacity of a 204-acre farm under the old methods!

What about labor and equipment costs of working conservation treated fields? Of the 454 men, 117 replied the conservation program saved both labor and the use of farm machinery—a saving amounting to $12,592 annually. Wallin's reply was that no labor has been saved but that equipment costs are less because operations are on the contour or level. He has found soil conservation farming to be profitable, any way it's figured.

REVIEWS

BUREAUCRACY: A CHALLENGE TO BETTER MANAGEMENT. By J. M. Juran. Harper and Brothers, New York. 1944.

" . . . The Government population could be cut in half, and this while performing all the present functions with at least present effectiveness."

Such is the startling epilogue—not of a Congressional investigating committee nor of a political phrasemaker, but of a federal employee, a fellow-member of this bureaucracy called the United States Government. And Mr. Juran backs up his conclusions in eight short chapters packed with good, common sense, touched up with a spirited realism that makes this self-styled "treatise on the nature of the bureaucratic world" not only penetrating and analytical but also delightfully readable.

To achieve the herculean task of shrinking the government population without impairing its effectiveness, Mr. Juran simply prescribes *"the utilization of scientific principles in government to the same extent as is today practiced in progressive industry."*

Thus speaks Mr. Juran, the management philosopher. Juran the realist, however, recognizes the road ahead as an obstacle race, full of ruts (decidedly) and pitfalls. He

is thoroughly aware of the giant size and complexity of the organism that Congress (the "god" of the Juran vocabulary) creates and then rares back and views with alarm, occasionally succumbing to the natural urge to slash at the periphery with a "meat-axe" abandon that may indeed nip off vital tissues as well as unnecessary padding.

He knows about that nefarious practice of duplication which he labels "the common cold of the bureaucratic world" and the development of which he ascribes to the basic human desire for self-sufficiency. This self-sufficiency, he says, becomes the umbrella which the weather-wise bureaucrat has found indispensable when storms of criticism or clouds of investigations appear on the horizon. And he has also run into the bureaucrat who agrees that avoidable duplication is present but insists that "the way to cut it out is for those other guys to quit duplicating what I am doing."

The author's treatment of such thoroughly aired items as "red tape and systems" is refreshingly different. He describes red tape as "the popular phrase for a series of diseases which arise from identifiable and curable specimens of management germs." And he goes on to identify those germs by flitting easily from analogy to analogy.

There are too many "post offices," he says, through which vital information must be cleared and stamped before reaching its ultimate objective. Similarly, there is too much "stratification"—too many layers through which action has to travel up and down and back up again, leaving the man at the foot of the organization deprived of all discretion and initiative. The federal government is visibly suffering, he feels, from the theory of "no errors at all costs," a theory exemplified by a complete and detailed auditing of travel vouchers even though the amount disallowed is far less than the salary of the auditors. And he decries the governmental using of standard battle-sized equipment to eradicate large-scale swindles as well as to ferret out 25 cents excess taxi fares.

If the author had stopped with his critical analysis of the management ills of our federal society, his book would still be of considerable value. But the other half of the title, "the challenge to better management," is by no means left unsupported. He quickly disposes of the quack remedies, the popular myths of management, such as the "one-central-agency" theory or the Presidential edict as a complete cure-all for the existing bureaucratic confusion. The job of effecting the cure, he says, is a task that is "*enormous, intricate, work-consuming, and time-consuming.*"

The Juran-recommended cure consists of a five-point program of utilizing tools of scientific management:

1. A management policy for the federal government; 2. and 3. development of intra- and inter-agency means to carry out the policy; 4. collection, adaptation, and dissemination of management techniques; and 5. development of competition to stimulate suggestions and improvements. Doubtless, these have been heard of before, but, as explained by Juran in the light of the myths and obstacles prevalent in the bureaucratic world, for once they are fired with sparks of realism.

All in all, Mr. Juran's treatise on bureaucracy is recommended reading, both for the bureaucrats themselves and for the bureaucritics—which just about covers the waterfront of the reading public.

—Verna C. Mohagen

BIOLOGY FOR BETTER LIVING. By Ernest E. Bayles and R. Will Burnett. Silver Burdett Company, New York. 1941, 1942. 754 pp.

In adapting the curriculum to the practical needs of future citizens in a democracy, educators always have been confronted by a serious problem in finding suitable textbooks and teaching guides. "Biology for Better Living" is an outstanding contribution toward meeting this need in high schools and junior colleges. The authors have designed it to develop insight and understanding. Among students who will have to participate in the reconstruction of a world in which change is constant and normal.

The studies deal with active problems in such a way that students should accept them as challenges and press for their solutions. After an inspiring introductory unit dealing with "Biology—A Study of Life" and "Science—A Method of Obtaining and Testing Knowledge," Unit One devotes six chapters to "Problems of Good Land Use." The chapters in this unit include "The Soil, Our Heritage," "The Formation and Composition of Soil," and three chapters dealing with the relation of plants to soil, with a final chapter titled "To Save Our Land," in which the conservation of farm lands and the functioning of the soil conservation districts are described. The book closes with the unit, "Conservation of Our Biologic Wealth" in which "The Control of Pests" and "Wildlife Conservation" are dealt with understandingly.

The text deals with a variety of biological questions in a similarly practical way, revealing unit by unit such scientific information as how living things are adapted for the lives they lead, how living things may be developed and improved, relationship of the body to food and environment, preventing and combatting disease, and the care of injuries.

Many of the chapters touch upon the subject of conservation which is emphasized in both the opening and closing of the book.

Subjects discussed in the text are introduced with a question or statement of a problem, after which the text proceeds with alternate consideration, to finally reach a conclusion or generalization. Historical light is thrown here and there on present problems, but always interestingly. No attempt is made to explain all the mysteries of life. Rather the progress of discoveries to date is unfolded and the unproven future is left as a challenge to young scientists.

Throughout the text excellent illustrations are used including reproduced photographs from many sources that make each biological lesson a live subject. Instead of merely explaining a scientific fact the caption of each illustration includes one or more thought-provoking questions.

A glossary of 462 biological terms is helpful to students.

Conservationists will be especially interested in becoming acquainted with "Biology for Better Living" because of the frequent requests they receive for suitable information on soil and water conservation for use in schools. "Biology for Better Living" states the general problems and general solutions, lays an excellent foundation for understanding local problems in land use and soil and water conservation, and will stimulate interest in active programs for the solution of these problems.

—Edwin C. Hollinger

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SOIL CONSERVATION SERVICE

The Soil Conservation Service in Pennsylvania. Soil Conservation Service, Harrisburg, Pennsylvania. May 1944. Processed.

OFFICE OF INFORMATION U. S. DEPARTMENT OF AGRICULTURE

Conservation and Development of the Forest Land Resources of the Southwest. Chemurgic Papers, No. 352, Series. 3. Southern Forest Experiment Station, U. S. Forest Service. 1944. mm.

STATE BULLETINS

Alfalfa Breeding. Bulletin No. 124. Agricultural Experiment Station, University of Nebraska, Lincoln, Nebr.

Annual Report of the Director for the Fiscal Year Ending June 30, 1943. Bulletin No. 244. Agricultural Experiment Station, Newark, Delaware. December 1943.

Beef Cattle Production in Alabama. Circular No. 257. Agricultural Extension Service, Alabama Polytechnic Institute, Auburn, Ala. June 1943.

Better Wartime Use of Farm Manure. Bulletin No. 639. Agricultural Extension Service, Cornell University, Ithaca, New York. March 1944.

Bimonthly Bulletin. Vol. XXIX, No. 230. Agricultural Experiment Station, Wooster, Ohio. September-October 1944.

The Black Point Disease of Wheat. Bulletin No. 330. Agricultural Experiment Station, Fargo, North Dakota. April 1944.

Crimson Clover for Grazing and Soil Improvement. Circular No. 254. Agricultural Extension Service, Alabama Polytechnic Institute, Auburn, Ala. June 1943.

Current Farm Economics, Oklahoma. Vol. 17, No. 4. Agricultural Experiment Station, Oklahoma A. & M. College, Stillwater, Okla. August 1944.

Current Farm Land Market Activity in Texas. Progress Report No. 902. Agricultural Experiment Station, Texas A. & M. College, College Station, Tex., with the cooperation of the Bureau of Agricultural Economics, U. S. Department of Agriculture. August 1944.

An Efficient, Labor-Saving Method of Steaming Soil. Bulletin No. 635. Agricultural Extension Service, Cornell University, Ithaca, New York. January 1944.

Farm Ponds in Missouri. Circular No. 482. Agricultural Extension Service, Columbia, Missouri, January 1943.

Farm Tenancy in Box Butte County, Nebraska. Bulletin No. 336. Agricultural Experiment Station, University of Nebraska, Lincoln, Nebr.

Farm Tenancy in Clay County, Nebraska. Bulletin No. 337. Agricultural Experiment Station, University of Nebraska, Lincoln, Nebr.

Fertilization of Farm Fish Ponds. Circular No. 270. Agricultural Extension Service, Alabama Polytechnic Institute, Auburn, Ala. January 1944, reprinted February 1944.

Fertilizer Reccomendations for Spring and Summer Crops, 1944. Circular No. 504. Agricultural Extension Service, Columbia, Missouri. January 1944.

Florida Farm Prices. Bulletin No. 399. Agricultural Experiment Station, University of Florida, Gainesville, Fla. June 1944.

Forest Grazing in Relation to Beef Cattle Production in Louisiana. Bulletin No. 380. Agricultural Experiment Station, Louisiana State University, University, La. June 1944.

Forty-eight Ways to Save the Soil While Increasing Production. Agricultural Experiment Station, Oklahoma A. & M. College, Stillwater, Okla.

Laws and Regulations Concerning the Inspection of Nurseries in Connecticut and Transportation of Nursery Stock. Circular No. 158. Agricultural Experiment Station, New Haven, Conn. March 1944.

Nitrous Acid and the Loss of Nitrogen. Memoir No. 253. Agricultural Experiment Station, Geneva, New York. October 1943.

Planting Methods for Farm Woodlands. Circular No. 497. Agricultural Extension Service, Columbia, Missouri. October 1943.

The Present Status of Range Reseeding in New Mexico. Press Bulletin No. 987. Agricultural Experiment Station. State College, New Mexico. 1944. mm.

Produce High Quality Hay, Harvest Early and Save Leaves and Green Color. Circular E-381. Agricultural Extension Service, Blacksburg, Virginia. May 1944.

Recent Trends in Land Tenure in Texas. Bulletin No. 641. Agricultural Experiment Station, Texas A. & M. College, College Station, Tex. June 1944.

The Relations of Vegetative Composition and Cattle Grazing on Nebraska Range Land. Bulletin No. 123. Agricultural Experiment Station, University of Nebraska, Lincoln, Nebr.

Report of the Director for the Year Ending October 31, 1943. Bulletin No. 477. Agricultural Experiment Station, New Haven, Connecticut. January 1944.

Seed Saving on Alabama Farms. Circular No. 256. Agricultural Extension Service, Alabama Polytechnic Institute, Auburn, Ala. June 1943.

Small Grain Production in Alabama. Circular No. 258. Agricultural Extension Service, Alabama Polytechnic Institute, Auburn, Ala. June 1943.

Soybean Production in Nebraska. Bulletin No. 339. Agricultural Experiment Station, University of Nebraska, Lincoln, Nebr.

Tillage Tools. Bulletin No. 465. Agricultural Experiment Station, Pennylvania State College, State College, Pa. August 1944.

Wong, a Winter Barley for New York. Bulletin No. 796. Agricultural Experiment Station, Ithaca, New York. June 1943.

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WELLINGTON BRINK EDITOR

CONTENTS

Front Cover: Young William H. Simpson, Jr. becomes acquainted with a three-day-old heifer calf. His dad is a dairyman in the Montgomery County Soil Conservation District, Miss.

SOIL CONSERVATION *is issued monthly by* SOIL CONSERVATION SERVICE of the United States Department of Agriculture, Washington, D. C. The matter contained herein is published by direction of the Secretary of Agriculture as administrative information required for proper transaction of the public business, with the approval of the Director of the Budget. SOIL CONSERVATION seeks to supply to workers of the Department of Agriculture engaged in soil conservation activities, information of special help to them in the performance of their duties. Copies may be obtained from the Superintendent of Documents, Government Printing Office, Washington 25, D. C., 10 cents a copy, or by subscription at the rate of $1.00 per year, domestic; $1.50 per year, foreign. Postage stamps, will not be accepted in payment.

TERRACING for FUN

Lynn Stephens, entered by the Page County, Iowa, Soil Conservation District, was the winner of the third annual Midwest Plow Terrace Building Contest sponsored by the Mills County Soil Conservation District.

By GLENNON LOYD

Imagine farmers having fun building terraces with a plow! That's precisely what they are doing in southwest Iowa, where they've made a contest out of what was a ponderous undertaking with heavy or special machinery 10 years ago.

Sponsored by the Mills County Soil Conservation District, the annual Midwest Plow Terrace Building Contest promises to assume its place in the field of rural sports along with corn-husking contests.

In three years, the event has gained a lot of prestige in that section of Iowa, where level terraces and good rotations form an ideal erosion control combination on gently sloping land.

In contrast with the handful of curious who turned out for the first match, 1,500 enthusiastic spectators watched Lynn Stephens, an entry of the Page County Soil Conservation District, win the 1944 event staged on Charles Kayton's farm near Hastings.

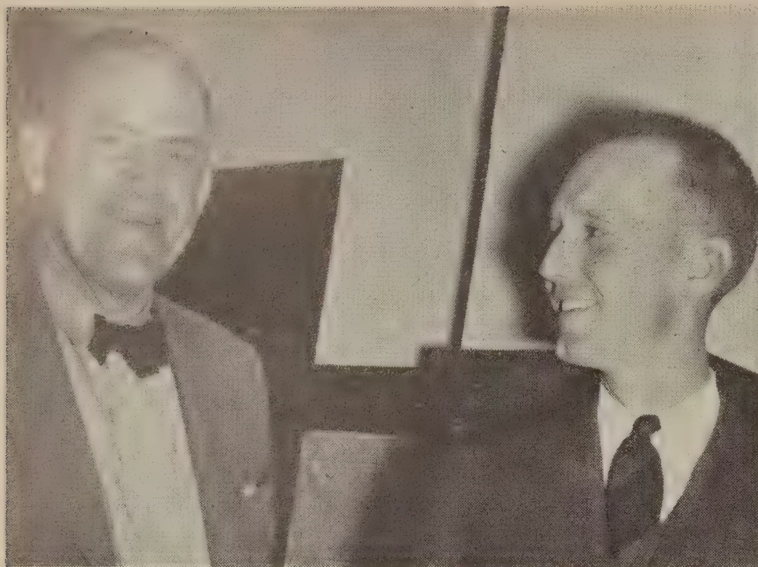
With his tractor and 2-bottom plow, Stephens, farmer and tractor operator at the Mount Arbor nurseries, Shenandoah, fashioned 300 feet of 94 percent perfect terrace in less than 2 hours.

Stephens showed a full appreciation of the earth-moving and mounding possibilities of the common moldboard plow, in wresting the title from George K. Welty, 1943 winner, who carried the banner of the Fremont County district. Welty was a runner-up in the 1944 derby.

Competition was keen among the 15 contestants. It included a farm wife, Mrs. Max Shook, one of the Mills County district representatives. And all of them threw up farmable terraces with plenty of water-holding capacity and broad bases on the 10 percent slope.

Judges William S. Speer, Merle Travis, and Faye McManigal reported that the terrace which won Stephens the $100 war bond had an effective

EDITOR'S NOTE.—The author is head, regional current information section, Soil Conservation Service, Milwaukee, Wis.



A. E. Jones, SCS chief of operations, Washington, D. C., and J. F. Wearin, Jr., chairman of the Mills County Soil Conservation District, which sponsored the contest.

Spectators, predominently farmers and their wives, spread over the 35-acre hillslope. As they do at husking matches, many of the watchers clustered around the lands of their favorites. Others moved constantly from one contestant to the next. A frequent remark was "That's simple. I could build one with my plow as easily as they can."

At the top of the field there were several commercial exhibits, as well as some of an educational nature. One tent that attracted many sightseers housed an exhibit of weeds and a display of soil-holding roots of numerous grasses and legumes adapted to that area of the state.

Tasty chicken dinners were served by the Strahan Methodist Ladies Club. A truckload of watermelons, one of the marks of most fall rural gatherings, also did a brisk trade.

Mrs. Max Shook, a Hastings, Iowa, farm wife, was the only woman entrant in the contest which attracted 15 competitors from 7 counties in southwest Iowa.

height of 22½ inches and a channel cross-section of 19 square feet. Speer, a Service district conservationist with headquarters at Denison, Iowa, was the technical expert of the trio. Travis, a cooperator with the Mills District, and McManigal, a cooperator with the Fremont district, were farmers experienced in both building and cropping terraces.

The judges' scorecard follows:

Water holding capacity	50 points
Tillability	20 points
Uniformity of slope	20 points
Efficiency of construction	10 points

A shotgun blast at 11 a.m. signaled the start of the event that had many of the trappings and much of the gala air of a cornhusking contest.

All of the 15 contestants, nominated by the commissioners of the 7 soil conservation districts in that territory, were farmers who had previously built terraces with their tractors and moldboard plows, the equipment they used in the derby.

The contest measured the skill of the entrants. But it did much more than that. As they sped back and forth in graceful arcs on their lands, the contestants showed much more dramatically than a mere demonstration that a farmer can build terraces with his own equipment.

The spectators' attention was called to the fact

A view of the east slope of the contest site.

that the terracing system was designed and staked out by Mills County district technicians. And over the loud speaker system, folks were advised to obtain the assistance of district technicians in designing, staking out, and checking completed terraces, as was done at Kayton's farm.

Third place in the event went to Bertel Engstrom, another Page County entry. In addition to Stephens, Welty, Engstrom, and Mrs. Shook, the other participants were: Paul Flowers and Clinton Richie, both of Adams County; Dominic Lickteig, Shelby County; W. T. Lorimor, Jr., Fremont County; R. S. Hibbs, Page County; Ray Kernan and John Stroburg, both of Taylor County; Harry K. Bashaw, Montgomery County; Kenneth Evans, William Buffington, and James Henderson, all of Mills County.

No two followed exactly the same pattern of construction, but they all got the job done. In general, however, they plowed as though they were back-furrowing. In successive waves they plowed and rolled the earth from the channel onto the ridge. They moved furrows uphill to form a gentle backslope.

To bridge the gap between the close of the contest and the announcement of the results, two disk tiller outfits plowed in a 6-foot gully and shaped it for seeding down as a grassed waterway.

That evening there was a dinner for the commissioners of the Southwest Iowa Association of Soil Conservation Districts and an informal meeting at which F. A. Wortman, editor of the Malvern Leader, presided. Speakers included J. F. Wearin, Jr., chairman of the Mills County district, Harry Linn, Iowa secretary of agriculture, Frank Mendell, state conservationist, and A. E. Jones, Soil Conservation Service chief of operations in Washington.

"Our land" said Jones, "is just as long and wide as it ever was, but it's not as thick in lots of places.

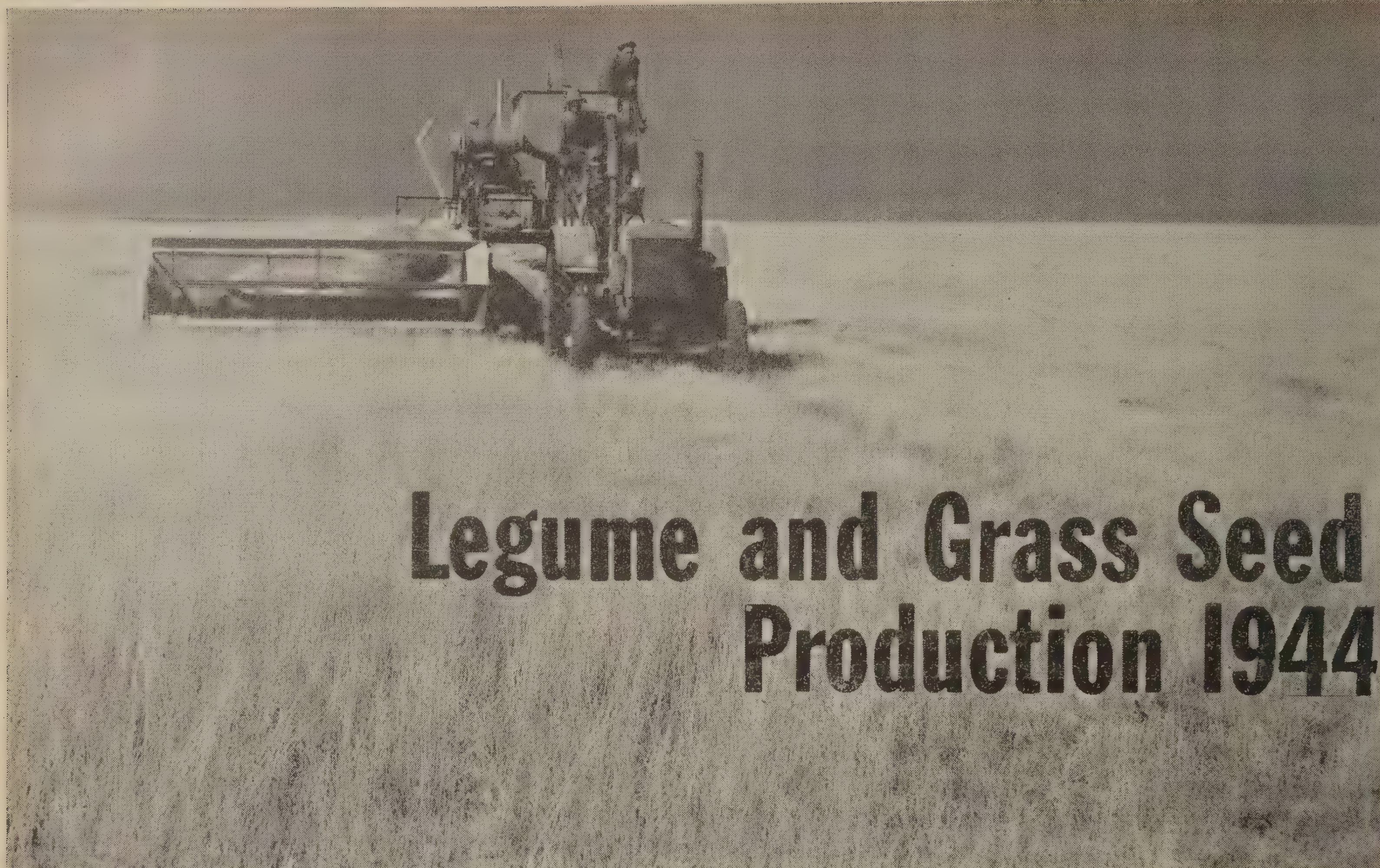
"We must build our soil from the top down, not from the bottom up. We must study to see how we can help nature build or maintain soil value.

"What would happen to your car or tractor if you ran it wide open constantly? It's just as hard on the land to farm it wide open, and we should plan farming operations at all times to have a safe margin in reserve.

"There's no short cut or easy way to do a soil conservation job. It costs money and effort. Our land investment is too large for us to guess what the soil needs."

Wearin and his fellow commissioners, J. M. Steele and D. N. McGrew, Ray W. Jones, district technician, and John H. Longstreet, county extension director, received a lot of commendation for the manner in which they handled the event. Already they are planning for next year.

And the sponsors envision the day when plow terrace building will be an interstate affair, attracting thousands as husking contests do. Already the idea is spreading. Approximately 500 persons turned out to see the first Marion County plow terrace contest held two weeks later in south central Iowa. Donald Van Ryswyk won this event sponsored by the Knoxville, Ia., community club and the Marion County soil conservation district.



Almost pure native stand of blue grama being combined in Texas with 12-foot machine. Many soil conservation districts have purchased combines recently for seed harvesting, but smaller machines are more popular.

Legume and Grass Seed Production 1944

By C. R. ENLOW

The drive for increased production of alfalfa, red clover, alsike, sweetclover, and other legume and grass seeds during 1944 was intense. Farm magazines and newspapers were full of articles concerning the need for seed. Constant reminders were heard over the radio. Wide publicity was given to the acreage and poundage payments for seed production under the AAA program. It's about time to add up results—what was the payoff in seed?

Frankly, results were rather disappointing except for red clover, timothy, orchard grass, bromegrass, crested wheat grass, and ryegrass, few grasses and legumes even approached the 1944 production goals. George Edler, Bureau of Agricultural Economics, has the task of estimating national production of grass and legume seeds, a difficult one at best, but his estimates are surprisingly close, judging by past years' records. George's reports come out promptly, as soon as he receives enough field reports to prepare estimates, at the time I write, the figures for 1944 have all been released except for lespedeza. The lespedeza estimate was to be released November 10.

Here are some headings of Edler's releases: "Alfalfa Seed Production This Year May be 15 Percent Below that of 1943"; "Alsike-Clover Seed Production This Year Expected to be Little Larger Than in 1943"; "Red Clover Seed Production Much Larger than in 1943 But Carry-Over on Farms and by Dealers Much Smaller"; and "Sweetclover-Seed Production Much Larger Than Last Year but One-third Below Average"; and so it goes.

The Seed Production Programs Committee of the War Food Administration last spring recommended definite action to secure more seed. The recommendations included (1) support prices for several seeds, in order that farmers would know that market prices would not fall below specified prices; (2) additional payments per pound for harvesting seed of alfalfa, red clover, alsike clover and others of which the seed supplies were critically short, provided the seed was marketed by a specified date; and (3) that an intensive program through the press, radio, by meetings and individual contacts with farmers be started to secure

Editor's Note.—The author is chief, agronomy division, Soil Conservation Service, and chairman, Seed Production Programs Committee, War Food Administration, Washington, D. C.

more seed. The task force of the seed trade, a group of commercial seedsmen appointed by the War Food Administration to advise and assist with seed problems, worked diligently with the seed committee and also independently to secure increased seed production. State Experiment Station and Extension workers devoted a lot of time and effort to the need for more seed.

For the specific purpose of encouraging an increased harvest of legume and grass seeds, Congress increased the appropriation of the Agricultural Adjustment Agency by $12,500,000. This money made it possible for that Agency to expand the harvesting of legume and grass seed practice which had already been provided for in the 1944 Triple-A program. In addition to making payments on an unlimited acreage for harvesting legume and grass seeds, enough money was available for making small poundage payments for harvesting seed of alfalfa, red clover, and alsike clover.

The following table gives the estimated production for 1944 of seed of several legumes and grasses. The goals are also given. These were prepared after full consideration of needs for seed for use on farms, for military purposes, and for export to our allies through lend-lease and relief channels. Production figures of recent years are given for comparison.

Legume and grass seed production estimates, 1944, compared with established goals and recent years' production (in thousands of pounds, thresher-run seed)

	1944 production (estimated)	1944 goal	Average annual production 1937-41	1942 production	1943 production
Alfalfa	60,354	102,000	76,307	58,854	70,734
Red clover	108,354	115,000	90,599	61,566	69,354
Sweetclover	35,862	67,000	65,620	37,518	25,692
Alsike clover	14,886	27,000	19,562	15,144	13,614
Sudan grass	55,200	71,000	67,974	40,440	31,500
Bromegrass	*13,630	9,000	**	*9,080	*8,470
Orchard grass	9,744	9,700	***6,108	8,582	8,148
Timothy	60,840	58,000	95,022	75,532	74,367

* Clean seed.
** Not available.
*** 1938-42 average.

It is interesting to note that although the production of alfalfa seed was about 15 percent smaller than in 1943, it is estimated that farmers harvested 774,000 acres, which is more than the 763,800 acres harvested in 1943. Unfortunately, weather conditions before alfalfa seed was ready for harvest in the Great Plains reduced acre yields materially and undoubtedly resulted in the harvesting of a much smaller acreage than had been planned.

An increased production of red clover is expected in the States in the Central Corn Belt, particularly in Illinois, Missouri, Ohio, Indiana, Iowa, and Kansas. Washington also is expected to produce more seed than last year. Most other States normally producing red clover seed probably produced less than in 1943.

In addition to the legumes and grasses listed in the above table, there are several others of considerable interest. Ladino clover, a comparatively new but exceedingly popular crop, has an estimated seed crop of 880,000 pounds, more than double that of last or any previous year, but still far below the goal of 1,500,000 pounds. The production of Austrian winter pea seed is estimated at 46,000,000 pounds, less than one-third of the 1943 production of 150,500,000 pounds, and slightly below the 5-year (1938-42) average of 55,040,000 pounds. Because of the tremendous production in 1943, a large surplus has been carried over into 1944, and the available supplies for seeding this fall were more than adequate.

Crimson clover seed production is estimated at 13,860,000 pounds, some 3,000,000 pounds less than the goal. Crested wheatgrass jumped to 25,030,000 pounds, approximately four times the 1943 production. This seed can be harvested as readily as wheat, and a combination of support price and an acreage payment for harvesting resulted in a tremendous seed crop. For once there is ample crested wheatgrass seed to plant many thousands of acres of abandoned cropland and depleted ranges that need reseeding in the Northern Plains, if machinery can be set in motion to get the job done.

The production of common ryegrass seed is estimated at 31,500,000 pounds; white clover at 1,290,000 pounds, slightly more than half the 1943 production of 2,310,000 pounds, but still above the 1938-42 average production. Hairy vetch seed production is estimated at 19,330,000 pounds, scarcely more than half the desired production; common and Willamette vetch, on the other hand, jumped from 26,800,000 pounds in 1943 to an estimated 38,400,000 pounds in 1944, and may result in a surplus, as these varieties are not so winter hardy as hairy vetch and the demand for the seed is not so great.

Seed production of Kentucky bluegrass and redtop was exceptionally low in 1944, but this is not serious, as these grasses are used more for lawn seeding and are not particularly important in the food production program. A million pounds of meadow fescue seed is the estimated production, which is above the 5-year average of 825,000 pounds. This grass at present is used mostly for export, being popular in the British Isles.

Crested wheatgrass can be handled like wheat. This scene might easily be confused with the harvesting of wheat. Kenneth King, assistant state conservationist, sits on a 2-foot silt bar washed from an up-and-down field planted to corn, near Ames, Iowa.

Among the comparatively new legumes and grasses that are coming into seed production in the Southern States, blue lupine is estimated at 6,400,000 pounds of seed, nearly one and a third million pounds higher than the 1943 production. This is a marvelous record for a new crop. Production figures are not available on wild winter peas and crotalaria, but there is little doubt that seed of these crops has been materially increased.

Native western grasses were eligible for the AAA harvesting payment, but no estimates on production are available. It is hoped that there will be a material increase in seed supplies of the bluestems, gramas, wheatgrasses and many others.

There is no doubt that the interest that soil conservation district supervisors have taken in seed production has had a lot to do with maintaining and increasing the production of grass and legume seeds. Of course, it is impossible to guess what seed production in 1944 would have been without all the campaigning that has been done, but judging by the trend the past two years, there is not much doubt that it would have been much less than was secured. Soil Conservation Service technicians who have devoted efforts during 1944 toward increased seed production are to be commended. An effective soil conservation program cannot be applied to the land without ample supplies of grass and legume seeds, and neither can the high production records of food and feed crops be maintained for long, as grasses and legumes are necessary to conserve the soil and keep it productive. Grasses and legumes are the principal agronomic tools to effect conservation, and efforts must be continued the coming year to increase seed production of these plants.

About 30 million acres could be brought into production through drainage alone. Millions of other acres need such treatment as terracing, contouring, strip cropping, gully control, stock-water ponds, and plantings of grasses, legumes, and trees, according to the needs of the land. We need this now for top production; and it is needed at all times for national security.

These and other types of beneficial work on the land would provide the best kind of employment for ex-service men. Many boys in the armed forces write us that this is what they hope to do. Their work would help lay a solid foundation for our agricultural plant of the future. With this help, and adequate technical assistance, farmers could apply conservation measures necessary to build up their soil to maximum production. We know where the work is needed and we know how to do it.—*H. H. Bennett.*

GONE WITH THE CLOUDBURSTS

William L. Tayloe of the Mahaska County Soil Conservation District office, Iowa, observes some of the 6-inch gullies washed in a field where corn had been planted up and down the slope. Harrowing failed to erase the gullies formed by the heavy rains.

By FRANK H. MENDELL

George McCalmant, who lives in the town of Wyoming, is one Iowan who'll never forget the wrath of the storms that walloped the state in May and June of 1944.

A flash flood in Little Bear Creek swept McCalmant from inside a garage where he sought shelter. Carried downstream by the rushing current, he managed to grasp a bridge, which he clung to until it, too, washed away. When rescuers finally got him, McCalmant was clinging to a tree.

While McCalmant will remember the storms because one almost cost him his life, many Iowa farmers will recall them because they swept away a lot of life from their slopes and hillsides.

EDITOR'S NOTE.—The author is state conservationist, Soil Conservation Service, Ames, Ia.

Kenneth King, assistant state conservationist, sits on a 2-foot silt bar washed from an up-and-down cornfield near Ames, Ia.

Iowa's farmland experienced its most frightful run of soil washing in history during May and June of 1944. Never before had so much of the state's land been open and at the mercy of the raindrops.

Naturally, the swollen streams and flooded rivers grabbed the big headlines. The Missouri, the Little Sioux, the East Nishnabotna, the Raccoon, the Des Moines, the Skunk, the Iowa and the Mississippi all were on the rampage.

Farley Henkes, cooperator with the Clayton County Soil Conservation District, Iowa, cultivates corn on one of his strip-cropped slopes. Henkes, who has had a soil conservation program for 8 years, says it has stopped serious erosion and increased crop yields one-fourth.

But for the first time the fearful erosion, the washed-out crops and the water-logged uplands captured a share of the attention.

We estimated, I believe conservatively, that the persistent heavy downpours washed away some $154,000,000 worth of soil from the 5,000,000 acres of sloping land that were exposed.

Our estimate was based on an average loss of 35 tons per acre, but observations of our staffs working with Iowa's 45 soil conservation districts disclosed that there were many fields that lost as high as 200 tons per acre.

Two localized storms give an idea of the force that nature unleashed upon the unguarded slopes and inadequately drained level uplands.

At Ames, where our state office is located, we had one rain that statisticians told us could be expected only once in 10,000 years. On ground

that was already pretty well saturated, 8.21 inches fell in 37½ hours.

In the rugged country north of Dubuque, the little Maquoketa river, in disgorging the excess storm water from one of the soakers, carried a silt load that amounted to more than 3 tons of soil per acre from the whole 130 square mile watershed. From this one rain the small stream dumped silt equal to a 7-inch layer of topsoil on 230 acres.

To convert the soil loss to a dollar and cents basis, we valued the topsoil at $1 per ton, a most conservative figure. One city resident wrote that

Sweet clover seeded in corn following by last cultivation in 1943 guarded this 35-acre slope against washing during the big rains of May 1944. William Streeter, Marion County farmer, observed that the rank growth also helped to remove the excess moisture from his land.

he'd take all the topsoil I could deliver at $1 per ton.

Many Iowa farmers noted that they could help temper the rise of the rivers by holding more of the rainfall on their own slopes. Milo Wolrob, a cooperator with the Linn County Soil Conservation District, reported that contoured rows in his cornfield held all the water on his slopes during a 3-inch downpour.

"Similar rains in other years," Wolrob said, "left many gullies on the slopes and covered up the corn at the foot with silt. This year there was practically no washing on the slope, and no silt down on the flat below."

On the farm of Thomas Glenn, who cooperates with the Wapello county district, corn planted on the contour on land plowed out of alfalfa sod showed no signs of erosion. On a similar slope that was in corn in 1943, and planted to corn again, up and down hill, gullies formed in each corn row.

In numerous areas, however, the big rains illus-

Grant Sidebottom cultivates corn on a terrace backslope on the farm of E. G. Knoke, a cooperator with the West Pottawattamie County Soil Conservation District. These plow-built terraces stopped soil washing.

trated the need for a complete soil conservation and drainage program. A single practice, such as contouring, just wasn't enough. From the Mills county district Ray W. Jones reported: "Contour planting of corn has been less successful than in former years, there being more breaks, even on those fields that were laid out accurately. We're of the opinion that a large amount of this trouble is due to improper land use rather than to the amount of rainfall, for even among our conservation farmers we find instances of corn following corn for their third and fourth year on the more sloping land."

Paul Harp, a cooperator with the Marion County District, found that although his terraces ran some water, "I didn't have any serious erosion on the terraced fields. The rains showed us that we need more than contour rows and buffer strips of grass to control erosion on our fields."

And E. S. Loyd, a cooperator with the Mahaska County District, pointed out that terraces need to be teamed with a good rotation in line with the land's adaptability to work effectively.

All of the new terraces that Loyd had built in sod ground and planted to corn showed no silting in the channels. Some older terraced in a field that went into beans for the third straight year silted about half-full.

In contrast, John Soderburg, a cooperator with the Adair County District, who has followed his

(*Continued on page* 127)

Downstream Interests

Ruin of cropland on Ohio River flood plain by deposition of sterile sand during flood of January 1937.

By CARL B. BROWN

A large and growing class of downstream interests is affected by the products of erosion—increased floods and sediment. For the most part these interests have not recognized their direct responsibility to share in the job of soil conservation. Why? The most apparent answer is that soil conservationists either have not determined the effect of soil conservation on their problems or have failed to "sell" them on the soil conservation program. Let us look at a few of the 10 major types of downstream public and private enterprises that have a stake in the use and conservation of uplands, namely: (1) valley agriculture (2) drainage (3) irrigation (4) flood control (5) commerce (6) fisheries (7) recreation (8) public health (9) power and (10) water supply.

VALLEY AGRICULTURE

The ill effects of flooding and infertile sediment deposits on valley croplands are so widely distributed that nearly all soil conservation districts are faced with some problems of this character. The total annual loss to valley crops and croplands from floods and sediment is measured in terms of hundreds of millions of dollars. As a "horrible example," consider the Little Tallahatchie Watershed in Northern Mississippi where erosion has advanced to an extremely critical stage. This watershed, containing 867,476 acres—a little more than 1,000 square miles, was opened for settlement just a century ago. Approximately 8¼ percent of the area consists of alluvial flood plains. In three generations 294,000 acres have been forced out of cultivation as a result of erosion and about 75,000 acres are virtually ruined by gullying. As a result the runoff is so rapid and the stream channels so clogged with sediment that a ½-inch rain causes damaging floods. Excessive flood damages now affect 65 percent of all of the 71,800 acres of bottom land. In a normal year, about 15 floods occur somewhere in the watershed, of which 4 normally occur during the growing season. The average annual flood-water damage to crops alone amounts to $301,483. But over and above this, the present agricultural damage from sedimentation on flood plains and in stream channels is estimated to be

EDITOR'S NOTE.—The author is head, Sedimentation section, Soil Conservation Service, Washington, D. C.

$591,023 annually. The latter figure represents the cumulative loss in productivity of all flood plain acres affected by sedimentation, and it is increasing year by year.

This flood and sediment damage all occurs *above* a major flood-control reservoir—the Sardis Dam. It is particularly significant to the soil and water conservation program that about 75 percent of all flood damages occur on headwater tributaries generally *above* the protection of major flood-control reservoirs and levee systems. These damages to innumerable small acreages are largely agricultural and are almost completely overshadowed by the more spectacular 15 percent of damages to urban areas and 10 percent of damages to main stem floodplains. Yet the 75 percent can be controlled only by soil conservation and small structures.

Valley landowners need to be shown the relation between their problems and the roots of these problems on the uplands. They must understand where and how they can contribute to the soil conservation program for their own benefit, even though their contribution may apply to remedial work on their neighbor's land above.

DRAINAGE

Drainage is one of the major types of capital improvements in agriculture. To 1940, more than $690,000,000 had been invested in drainage enterprises. More than one-half of this amount was spent in the construction of open ditches. The annual expenditure for maintenance of open ditches is approximately $1,800,000. A large share of this cost is for removal of sediment coming from eroding uplands. The actual cost of sedimentation to drainage enterprises is probably much greater than this figure would indicate, for many ditches are not properly maintained, as a result of which the entire capital investment gradually is being lost. In many places it would be considerably cheaper in the long run for drainage districts to cooperate in an erosion control program than to bear indefinitely the annual expense of ditch cleaning.

IRRIGATION

As of 1940, slightly more than $1,000,000,000 had been invested in irrigation enterprises in the western states, and the area that could be irrigated by the then existing works comprised slightly more than 28,000,000 acres. The annual cost of maintenance and operation of the irrigation enterprises was a little more than $43,000,000. A considerable share of this cost was for cleaning silt from irrigation canals. For example, a careful survey has been made of the cost of cleaning irrigation ditches in the Sevier River Watershed, Utah. The cost of maintaining ditches subject to flooding and excessive sedimentation from overgrazed mountain watersheds was compared with the cost of maintaining ditches which are relatively free from flood and sedimentation damages. The analysis shows that the cost of cleaning 160 canals and laterals representing 1430 miles of ditches was $19,898 per year more than the cost would have been if the water coming into these ditches had been derived from well vegetated drainage areas similar to those above the check ditches.

In addition to the large annual ditch-cleaning cost, irrigation enterprises are faced with the serious cumulative problem of silting of irrigation storage reservoirs. More than 1800 such reservoirs have been built in the western states at an estimated cost of $395,000,000, and this does not include the apportioned cost of multiple-purpose reservoirs such as Boulder Dam. The annual silting damage to these reservoirs amounts to several million dollars.

POWER

In 1942, stationary power plants in the United States generated approximately 235,000,000,000 kilowatt hours of electricity. This is approximately 2/5 of the world's total power production. No wonder this country could develop so rapidly the most powerful military force in the world. Approximately 1/3 of our power production comes from hydro-electric plants. The average revenue per kilowatt hour for all classes of power sold in 1942 was 1.79c. At this rate the revenue derived from water-generated power would be approximately $1,145,000,000. The total investment in approximately 3,000 power dams and reservoirs has been $2,850,000,000, not including power-transmission lines and other facilities for distribution.

A major part of our water power depends on water storage reservoirs. No estimate has been made of the average annual damage from silting to this, our largest class of major reservoirs, but during the drought of 1941 the power loss in four Southeastern states due solely to the effect of silting in the power reservoirs of those states was esimated to be 90,000,000 kilowatt hours. This power was lost just at the time it was most urgently needed a the beginning of our war-time production program and was particularly felt in aluminum and certain other critical industries. At the national average sale price of electricity this

represented a loss of $1,600,000 due exclusively to sedimentation. Here is one major branch of American industry which is suffering severe losses from the effects of soil erosion, that so far has made no direct contribution to the conservation program.

Calloway irrigation canal on north side of Kern River, Calif., almost completely filled with sand. (Photo by courtesy U. S. Forest Service.)

WATER SUPPLY

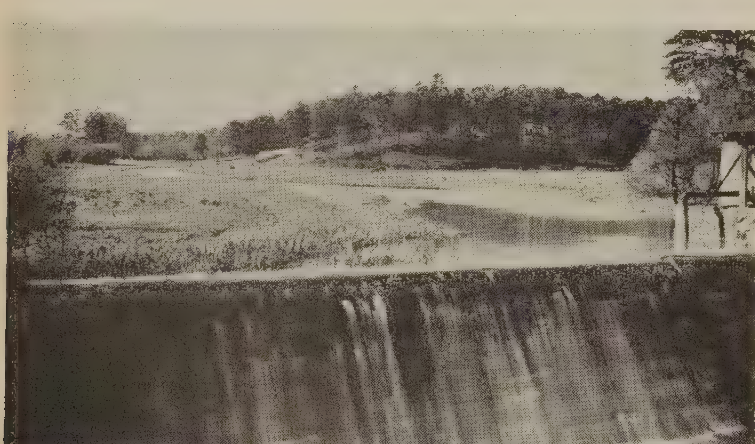
Approximately 32 million in this country and a large share of our industry uses filtered water, that is, water from which it has been necessary to remove the fine suspended soil particles, the products of erosion. The quantity of water annually filtered in the United States is something like 1,400 billion gallons. An investigation in the Piedmont of North Carolina showed that the average cost of chemicals used in water purification in that region was $5 per million gallons treated. It was found that an average 25 percent reduction in the suspended sediment load of a water-supply source, which would be a modest expectation from an adequate soil conservation program on a water-

Damage from sediment deposition to farm homestead and machinery in Republican River Valley near Guide Rock, Neb.

Panorama of delta at upper end of Loch Raven Reservoir, which provides water storage for Baltimore, Md. Approximately 1300 acre-feet of sediment have been deposited in the area shown, occupying reservoir space which cost $68.37 per acre-foot.

shed, would reduce the cost of chemicals in this region by $1.50 per million gallons. Considering that this is a region of relatively large silt loads, if a saving of only $1 per million gallons on an average throughout the United States could be achieved by conservation programs, the annual savings in cost of water filtration would be $1,400,000.

Over and above this cost is the damage from silting to water-supply reservoirs. It is estimated that approximately 26,000,000 persons, or 20 percent of our population, depend on 2,700 water-supply reservoirs which have been built at a cost of more than $566,500,000, exclusive of waterworks and distribution lines. It is estimated that as a result of silting alone, 21 percent of these reservoirs will have a useful life of less than 50 years and another 25 percent will last less than 100 years. Many cities and private water companies throughout the United States have long recognized the need for watershed protection and have carried out extensive reforestation programs. Hundreds of cities, however, have reservoirs on watersheds of relatively high-value agricultural land which cannot be purchased for watershed protection. Many of these watersheds are entirely within soil conservation districts. Many cities and water companies would be not only willing but anxious to participate in a conservation program if (1) they were aware of the rate of silting in the reservoir, (2) the sources of the damaging sediment were determined by adequate surveys and (3) the city people were convinced through information that expenditure of city funds on the watershed for conservation would lower costs of water treatment and ultimately lower taxes.



Dam near Spartanburg, S. C., almost completely filled with sediment.

RECREATION

Recreation is big business in the United States. Several hundred million dollars a year are spent for outdoor sports—hunting, fishing, swimming, boating, etc. Any handicaps to these sports represent a tangible loss to the individual who is willing to pay for them and will not spend his money on a substitute, and it certainly represents a loss to the community in which the individual would spend his money. Soil erosion and excessive frequency of flooding are causing recreational losses to many communities of which they may not be aware. For example, in the Meramec River Watershed, Missouri, studies by the Missouri State Planning Board showed that in 1940, 834,350 persons used this watershed for recreation during the period May 15 to September 30. The expenditure per person per day was valued conservatively at $1 above the normal cost of living. When the stream flow is above normal, and the water is muddy, recreational attendance was found to drop 33 1/3 percent because fish won't bite and swimming is poor. These conditions prevail during an average of 23 to 29 days of the recreation season. When the rivers were actually in flood, recreational attendance dropped 80 percent during an average of 1 to 4 days in the season. After making allowance for non-attendance during an average of 5 days of rain and for deferred recreation, the loss in recreational person-days due to floods has been estimated at 11,685 and due to silty water 49,090, an annual monetary loss on this basis of $60,775.

There are some 1,200 sizable recreation reservoirs in the United States which are estimated to have cost $67,500,000. These reservoirs are silt-

ing, some of them quite rapidly, as are our reservoirs for power, water supply, irrigation and other purposes. In some reservoirs, such as Lake Isaaqueena on the Clemson LU-Project, the water stays muddy so much of the time that swimming has been prohibited. In other reservoirs, such as Lake Lure at Chimney Rock, N. C., silt deposits over the man-made sandy beaches have greatly damaged recreational facilities and caused loss of property values to hotel and residential developments around the lake.

What about the practicability of some of the license fees and charges for use of recreational facilities being applied to conservation in the interest of preserving these facilities for public enjoyment?

CONVINCING THE FOLKS DOWNSTREAM

The steps necessary to secure the direct participation of all 10 major groups of downstream interests in the soil and water conservation program are basically the same as those necessary to "sell" the single farmer and rancher. The main job is (1) to determine through research the nature and extent of these downstream effects of erosion and their cost to specific individuals, towns, industries, etc., (2) to determine through surveys where measures need to be applied to correct these specific damages, and (3) to sell the affected parties through information and education on the benefits from cooperative action. Fortunately, the organizations for action, the soil conservation districts through which these affected parties can cooperate for their own protection, are already rapidly being formed. Some additional research is needed in the development of new and supplementary control measures, which are not ordinarily needed for the control of erosion on the farm, but by and large the measures that will cure the farmer's problems will also remedy most of the difficulties downstream.

Two thoughts are worth bearing in mind when it comes to cooperation. First, people don't like to spend their money without reasonable assurance of specific benefits therefrom. Second, people don't like to spend their money for something that seems to be of more benefit to somebody else than to themselves. In several attempts to develop farmer-city cooperation in protecting a city water-supply reservoir such a feeling has developed among the city folks below or the farmers above. While it is true that incidental benefits from conservation by any party will almost always accrue to some other party, the specific phases of conservation that will be of greatest benefit to upstream and downstream parties are often not identical but complementary. In many watersheds the worst damage downstream arises from severely gullied, abandoned or low-grade land which the landowners are most reluctant to treat. Usually the landowner should be urged to place emphasis on the protection and conservation of his *best* lands—those parts of the farm where returns from conservation will be greatest. Emphasis to downstream interests, on the other hand, should be placed on conservation of those parts of the watershed, and those sections of the farms, which produce the highest runoff and the greatest sediment loads. In many areas the contribution of downstream interests to erosion control on the worst lands would complete the farm conservation plan which the farmer himself may be unable to do.

GONE WITH THE CLOUDBURSTS

(*Continued from page* 122)

complete conservation plan closely, reported that he had never seen as much water come out of his terrace outlets before. But the excess storm water, he asserted, was as clear as a mountain stream.

Harold J. Nilsson of the Linn County district office reported that strip-cropped fields, too, handled a 6-inch rain of 3 hours duration, much better than did up-and-down fields in a 27,000-acre area of the county. He observed that the straight-rowed fields lost 4 or 5 times as much soil as comparable strip-cropped fields. Silt washed from the cropped strips was caught by grass and grain strips.

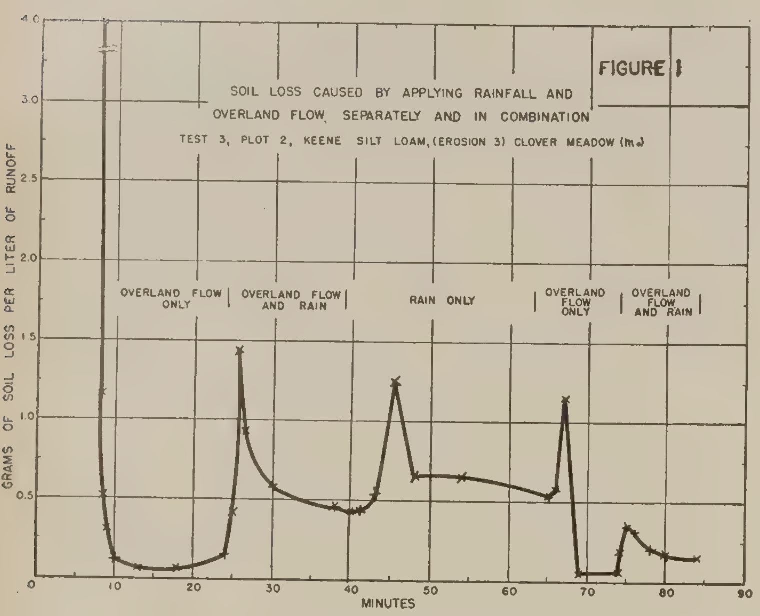
Kenneth Adkisson, a cooperator with the Jefferson country district, had no silt deposity in the grassed waterways of his contoured and strip-cropped fields. But in an adjoining field that had been in straight rows of corn and beans last year, there were gullies from 6 inches to 1 foot deep between the corn rows, and waterways were cut out from 1 to 2 feet deep.

In addition to the vast damage caused by washing, we had some 100,000 acres that stood idle because of improper drainage or flooding and siltation. Paul Jacobson of the Webster county district office, said that crops on approximately 30,000 acres in the county were killed by high water and inadequate drainage. Two-thirds of the acreage was replanted to corn or soybeans, but the remainder, mainly small areas within fields, either stood idle, or were used only for emergency crops.

Farmers and our men learned a lot from the

(*Continued on page* 135)

RAINDROPS, SURFACE FLOW AND EROSION



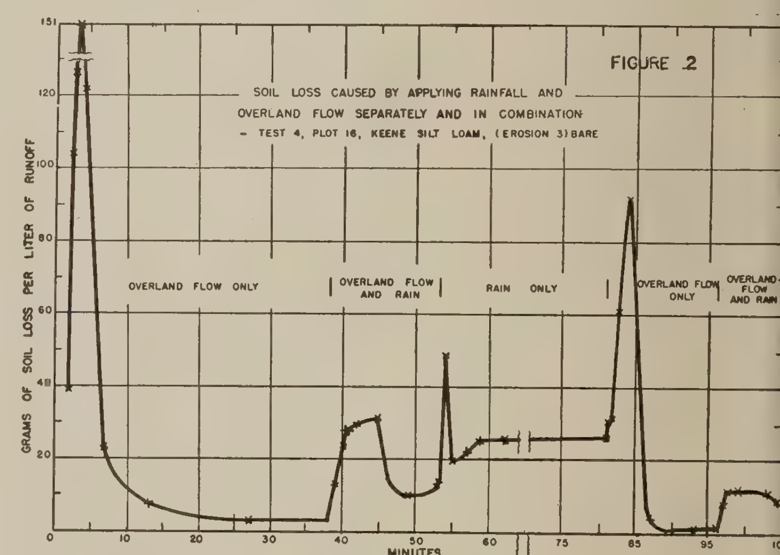
By W. D. ELLISON

Recently I made some soil erosion tests by applying rainfall and surface flow alternately and in combination, so that I could observe which caused the most erosion. The rainfall was applied with a standard type of "rainmaker" and the surface flow was applied at uniform depth across the full width on the uphill end of the plot. This flow was to simulate runoff which moves down out of one band of a strip cropped field and flows across another at a lower level.

The accompanying curves show the results. When rainfall ceased, the surface flow cleared up and, when it was turned on again, the surface flow muddied. It is an easy matter to demonstrate that the full carrying capacity of the flow was not taxed by the soil carried off the plot. The rate of tearing the soil loose from the surface and entraining it in the flow was the controlling factor in the erosion process.

When the surface flow was first turned onto the plots it picked up the loose flakes of soil and dust particles lying loose on the surface. After this loose material was gone the surface flow didn't carry much soil again until the raindrops were turned on to help dig or tear more soil loose. From evidence such as this we may infer that one of our big jobs in soil conservation work is to intercept raindrops, and prevent their falling directly on the soil surface. This is where cover crops and mulches serve so well.

It is very easy for us to see a few large streams of flowing water as they carry soil down the hillsides, often transporting tons of erosional debris as fast as a fleet of large trucks might move dirt away from a power shovel. But it is impossible for us to see the billions of raindrops doing the "pick and shovel work" which loads these water streams with the fertile topsoil from the many acres of smooth field surfaces. Under these conditions we are almost certain to underestimate the effects of raindrops and to overestimate the effects of surface flow.



The test shown in the first figure was made on a plot having oats stubble with a poor stand of timothy and clover about 3 to 5 inches high. In the second figure the test was on bare soil. The curves are very similar in shape and height of rise, but it will be seen that the vertical scale in the second figure is 40 times that of the first. This then, means that the amount of soil lost from the vegetated plot was just one-fortieth of the amount lost from the bare plot. A lot of this erosion control on the vegetated plot can be traced to the interception of raindrops by plants.

Most of the soil-laden streams and the gullies they cause in the hillsides are outward manifestations of deeper and more basic troubles. As the raindrops "pick" the soil loose, they also separate the particles, break down the granules, and mix, puddle and compact a shallow layer of the surface soil until a highly impervious surface seal is formed. In some soils this seal will almost "water-proof" the land.

To correct these primary troubles we must first control the destructive actions of raindrops. Some of the developments needed to improve on this

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part of our job include improvements in the use of cover crops and plant residues for protecting the soil against raindrop impact, and improvements in both crop rotations and soil management practices for building and strengthening soil aggregates. By protecting the soil with cover crops against raindrop impact, and strengthening the aggregates through soil management, one gets at the source of erosion, prevents damage to the soil, and preserves its structural properties and infiltration capacity at points where the raindrops fall.

GULLY HEAD CONTROL IN DEEP LOESS

By E. T. FERGUSON

Gully control structures are "but a memory" throughout most of the Southeastern United States, but in the fertile loessial soil along the Mississippi River concrete flumes are doing an important gully control job.

In this unstratified material, the face of the gully head, where the water pours in, stands vertical and the soil melts away like brown sugar when runoff from a drainage area even as small as one-fourth of an acre pours into the gully during a heavy rain. A gully 2 to 30 feet deep may advance uphill 40 or 50 feet during one storm. So far, no method has been developed for controlling the gully head with vegetation alone.

In Adams County, Miss., this form of erosion was destroying large areas of fertile soil that produces high crop yields and makes excellent pasture. At some point in every drainage way in the deep loess section of the county could be found a deep vertical-faced gully head. When the Adams County Soil Conservation District was organized, the problem of controlling these gullies was still unsolved.

In studying the problem in connection with the district program, a concrete flume was located on the Landsdown Plantation that had been constructed in 1916 and was still in good operating condition. This structure was simply a concrete trough, extending six feet over the lip of a gully, that discharged water from five acres of land to the gully floor 27 feet below. The force of the water had formed a natural stilling basin three feet deep in the floor of the gully.

On the basis of the performance of this structure, the commissioners of the Adams County Soil Conservation District authorized the design and construction of a flume on this principle. In cooperation with the district commissioners, the County board of supervisors of Adams County furnished a concrete mixer, hand tools, and lumber for construction of portable forms, which were designed so that they could be assembled to form any size flume desired. Flumes of this type are now being used to control gully heads on many Adams County farms.

Construction of one of these flumes, involving the use of 2.2 cubic yards of reinforced concrete which costs the farmer $30.18, required one day's time of six men for excavation, setting the forms, and pouring the concrete. Moving earth for a dam and diversion ditches cost $10.30, making the total cost $40.48. The drainage areas was 8 acres, making the protection cost $5.06 per acre, which is not excessive in view of the value of the land and buildings protected.

The discharge end of the flume is constructed to the edge of the gully and, as runoff water pours from the flume, the gully head caves back under the flume, the distance varying from 1 to 6 feet. After the gully head was caved back under the flume and is protected by the concrete structure above it, the gully head will stand vertical and its progress will be stopped.

Since the trough of the structure acts as a cantilever beam after the gully head has caved a few feet back under the discharge end of the trough, it is necessary to reinforce the upper edge of the beam with deformed steel bars to take care of the tensile stress in the upper edge of the beam. The headwall is also reinforced vertically and horizontally. Steel stirrups are placed in the side wall of the flume which extend through the floor and up the other side.

This reinforcement is of prime importance of the overhanging portion if the flume is to be prevented from breaking off. An additional safety feature may be the construction of a fuse plug at some point in the earth dam. This will take care of the possibility of the flume's being plugged with debris or being overtopped by rainstorms of unprecedented proportions.

EDITOR'S NOTE.—The author is work unit conservationist, Soil Conservation Service, Natchez, Miss.

Bank cover is essential to maintaining ditches at reasonable cost. Here's a drain cloaked in kudzu.

DISTRICTS EXCHANGE WATER FOR LAND

By JOHN G. SUTTON

Drainage is a first step toward conservation farming of flat, heavy, wet lands. It is a normal prerequisite to crop rotations, lime, fertilizers and legumes. It is often a necessary prelude to the development of a complete and balanced soil conservation program.

Frequently, however, the proper role of drainage is obscured. And it is one of the responsibilities of soil conservation district supervisors to keep the matter of drainage in its proper perspective, to insist firmly that due emphasis is given to every phase of the soil conservation program.

Drainage is often extremely profitable. It frequently pays for itself within one to three years. This fact should generally indicate to districts that only limited assistance is necessary from Federal sources and that the farmer may reasonably be asked to finance the major cost of such work himself. Sometimes, however, the extent of the public interest is such as to justify special assistance.

Generally, the Soil Conservation Service can furnish technical assistance only on farm drains as a part of farm conservation plans, and on small or medium size group jobs. Limited amounts of heavy equipment are available to districts. Such equipment is used chiefly for work of demonstrational value, in areas where contractors' equipment is not available at reasonable prices, and for jobs too small to contract.

It is interesting to review what some of the soil conservation districts have been doing about their drainage problems. Take, for example, the Newton County Soil Conservation District, which lies in the north portion of Indiana adjacent to the Illinois line. The county is largely covered by public drainage enterprises. The 1940 drainage census gives the land area of the county as 264,320 acres, of which 220,682 acres are assessed for 114 public drainage enterprises. There are 378 miles of public open ditches and 125 miles of public tile drains. Many of these public drains need rehabilitation and improvement and there are many farm drainage problems throughout the county.

The Newton County Soil Conservation District has a very interesting letterhead. Underneath the words "Newton County Soil Conservation District" is the following statement: "An organiza-

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tion of the farmers, by the farmers and for the farmers, promoting soil and water conservation and wise land use." At the bottom of the page is the invitation, "Call on us if you have drainage, erosion or soil fertility problems." The members of the Board of Supervisors are listed at the left and the five cooperating agencies are given at the right. The latter include Extension Service, Purdue University; Indiana Department of Conservation; Newton County Commissioners; Soil Conservation Service, U.S.D.A.; and State Conservation Committee.

In a special report prepared September 1, 1944, the district noted 18 requests for assistance on drainage jobs. Eight of them were for small groups of 2 or 3 farmers. The largest job benefited 12 farms involving 5,900 acres at a cost of $27,232. On this job $11,000 of reallotted conservation and use funds was furnished in accordance with the special program worked out in cooperation with the Agricultural Adjustment Administration.

On another of the jobs, benefiting 22 farms and 2,000 acres, the Service furnished rental of a dragline, which represented about half of the construction cost. Even though special assistance was granted on these two jobs (partly for demonstrational purposes), the other 16 jobs have gone forward without special assistance and groups of farmers have paid, or are arranging to pay, for the construction costs without Federal assistance.

The district not only has done creditable work in drainage but is also encouraging a well-rounded soil conservation program. It obtained a set of sewer rods and scoops for loan to farmers with which large tile lines could be cleaned readily. Yields of crops, checked by the district farm planner and county agent, indicated a 10-bushel gain in corn production and 4-bushel gain in soybean production when planted on the contour, as compared with similar fields planted in straight rows. It was found that an addition of 200 pounds of 0-9-27 fertilizer would produce increases in yields ranging up to 5 to 10 bushels of soybeans per acre on the black sandy loams. Other practices in the well-rounded program included grass planting, liming, fertilizing, terracing, diversions, waterways, protection of woods, cover crops, farm drainage, and woody plantings. The success of the district is indicated by the fact that another part of the county has recently petitioned to join and has been added to the district.

The Knox County Soil Conservation District at Vincennes, Ind., in its special report of September 1, 1944, noted the planning of 27 group drainage jobs, and the completion of 18 jobs benefiting 3,610 acres on 71 farms. The Service furnished technical assistance only, and the groups spent $22,722 to construct about 19 miles of open ditches involving 209,635 cubic yards of dirt. Improvement of the Roberson Ditch was described in the January 1944 issue of *Soil Conservation.* In the annual report for 1943 the district supervisors stated that the increased yields obtained on 2,565 acres drained during the year would be equivalent to 20 bushels of corn per acre. The estimate for the drainage jobs completed in 1943 includes both public and private drains. The Knox County District also has the other features of a well-rounded soil conservation program. In this instance no special assistance was given on excavation work, and dragline work was done by contract at the expense of the farmers.

The rate at which a well organized program moves when qualified specialists are available is shown by progress in Clark County, Ohio. The following is quoted from the 1943 annual report of this district's supervisors:

"We also have in the district a ⅝ yard dragline, which, after a few minor adjustments, will be put on a drainage project which is all ready to go. We have 2 drainage projects ready for the work and 6 applications waiting. This drainage work will be one of the outstanding programs in the district after it gets under way.

"Because of the difficulty of arranging drainage projects through County government, practically nothing has been done in the County for years outside of a few jobs completed by the CCC a few years ago.

"The supervisors also insist, wherever possible, that drainage applicants sign agreements to follow certain soil conservation practices along drainage projects."

In this district, between January 1, 1944 and August 30, 1944 surveys were completed on 7 group jobs which will benefit 26 farmers and 1,851 acres. Of these, 5 small jobs were completed, the average length of each job being 3,056 feet and requiring excavation of 3,280 cubic yards of dirt.

Good progress was also recorded in the Dodge County, Wis., Soil Conservation District.

In the first eight months of 1944 surveys were completed on 6 group jobs draining 1,556 acres. That drainage greatly improved the 61 farms involved is shown by the fact that the farmers agreed to contribute $44,607 for construction of 59,200 linear feet of open ditch and 52,000 linear

feet of tile drain, at an average cost of $28.67 per acre.

The Montgomery County Soil Conservation District, Illinois, summarizes 1943 accomplishments as follows:

"In February 1943 a dragline was loaned to the district by the Soil Conservation Service. During the year, 11 drainage plans were prepared and the ditches cleaned out, benefiting 13,157 acres. Work was completed in ttime to affect approximately 3,000 acres for 1943 production.

"The past spring was extremely wet and the ditch cleanouts showed immediate results. In fact, many farmers felt that the increase in production this year alone has more than paid for their share of the entire assessment. Through district cooperation and available equipment it is estimated that 80 percent more ditch cleanout has been done than would be possible by any other means.

"Based on past experience it is estimated that a direct saving in cost of ditch cleanout of approximately $10,000 was effected to the farmers of this county by the district drainage program. The above saving does not take into account the value of the increased crop production, due to better drainage. We feel that our drainage work has made a contribution to food production during this war period, when this country and our allies need more food. It is estimated that the work done on drainage in 1943 should under average wet conditions account for an increase of 48,400 bushels of corn and 20,700 bushels of soybeans in 1944."

There is a great need for drainage work in Iowa. Much of the best agricultural land in the State is the land which has been drained. The largest concentration of work is in the north central part of the State. The first soil conservation district in that territory was the Webster County District, which recognizes drainage as an important practice. An older district is the Page County District, which reported as follows:

"Due to the interest in drainage in this section of the State, an engineering specialist has been located at Shenandoah to direct the drainage activities and do whatever design work is necessary on such projects.

"During 1943, requests were received for drainage assistance in 12 different areas. The largest of these areas comprises 700 acres of otherwise wet land and the small areas average about 40 benefited acres. Plans and designs have already been completed on the large 700-acre tract for which a drainage district has been legally organized. One smaller job has been surveyed and designed and the estimates for both of these jobs are in the hands of contractors for bids.

"There is need for a full-time survey crew in this territory to facilitate and hasten the drainage program."

A little over a year ago the Agricultural Adjustment Administration and the Soil Conservation Service entered into an agreement to furnish special assistance on drainage work in the Red River Valley of North Dakota. This agreement was made in response to a request for assistance due to particularly severe damage on nearly half a million acres in the flat lands. Much of this was under water all summer. As a result of the special program, 15 jobs, involving 691,197 cubic yards, had been planned and approved up to September 15, 1944. Practically all of this area was brought within organized soil conservation districts in the last year. Drainage is accepted as a major concern. The following soil conservation districts have a large interest in land drainage:

Three Rivers, 363,791 acres; Southeast Cass, 210,669 acres; Rush River, 203,932 acres; Antelope, 322,745 acres; Fairmount, 274,938 acres; Southeast Traill, 146,560 acres; Northeast Traill, 173,440 acres; Eastern Grand Forks County, 292,480 acres; East Pembina, 364,880 acres. The solution of many of the drainage problems in this arear will require the building of community outlets, laterals, and farm drains, and in this work the soil conservation districts will have a major role.

Drainage conditions differ in the Midwest as compared with other sections. Outlet drainage was accomplished through open ditches at an original cost usually ranging from $3 to $10 per acre. Farmers had to resort to title for the drainage of heavy soils, at a cost running $20 to $40 per acre, or even higher. The land thus drained was usually very productive, most of it having a sales value of $75 to $150 an acre before the war. Farmers are accustomed to handling their drainage problems through organized drainage districts. In the States of Minnesota, Wisconsin, Michigan, Iowa, Illinois, Indiana, Ohio, and Missouri there are 52,923,988 acres of the 86,967,039 acres in drainage districts in the United States.

In other sections of the country drainage has had a more limited application. Many successful projects have been developed in the delta lands of the Mississippi valley. In still other areas drainage has moved forward more slowly. Unfortunately,

at times in the past, numerous ill-conceived drainage districts were organized in southern States, which resulted in large losses to investors and landowners. Some of them were forced through against bitter opposition.

During the first world war, or just preceding it, much work was started but not completed until the arrival of low agricultural prices after the armistice. Some of these projects were unsound in construction and design. In the South many small systems were installed, draining bottom lands in mill areas. As an example of high cost, the average cost per acre of the open ditches in Georgia was $23.48. Many of these systems were not maintained. The ditches filled up and financial loss occurred. Naturally, public sentiment developed against drainage of any kind, sentiment which has changed only with sound engineering and the application of common sense. No wonder, when we note how many main drains were constructed without providing farm drains and laterals! Furthermore, there were no changes in land uses based on land capabilities.

Many of these deficiencies are being corrected through soil conservation district programs. In undertaking drainage work through the program of soil conservation districts, sound engineering is provided for main drains. Adequate farm drains are planned in connection with farm conservation plans and the capability of each acre is determined. What this has meant is illustrated by work accomplished by the Lynches River Soil Conservation District, Lee County, S. C. This district gave assistance to the Atkins County Drainage District, comprising 14,500 acres of land lying in the southeast portion of Lee County. A major change was necessary in the main drainage system and two new drains were designed and constructed. As of June 30, 1944, completed work totaled 10.1 miles of ditches, providing major outlets for some 8,000 acres of land in the drainage districts. This was undertaken as a demonstrational job. The Soil Conservation Service furnished special assistance, including the loan of two draglines to the supervisors of the soil conservation district. Better drainage increased crop yields from 5 to 100 percent. Practically all of more than 100 farmers living in the drainage district applied for farm conservation plans.

This job created considerable interest in drainage in the coastal plains of the State. As a result, all coastal areas of the State have now organized into soil conservation districts. South Carolina was the second State to be fully covered by soil conservation districts. Good progress has been made with drainage work in other parts of the State, technical assistance only being furnished and farmers paying the entire construction costs. One of the larger and more successful jobs is the Great Swamp drainage job in the Jasper County Soil Conservation District. The job was undertaken by a land owner who had a large acreage, although the job was of the size ordinarily associated with group jobs. The work involved 8½ miles of main ditch, laterals, and farm drains, and the estimated cost was $27,443. The average cost was $11.08 per acre on the 2,477 acres benefited. A farm plan was worked out based on land capabilities. About 500 acres was scheduled to go into cultivation in 1944 and the remaining 2,000 acres are to come into production during the next two years. The development of this land and an additional area of 1,500 acres for permanent pasture should make it possible to increase from 160 breeding cattle to 1,200 cattle. The production of hogs will be increased from 300 to 400 animals per year. Turkeys will be increased from 5,000 to 20,000.

Other good drainage developments have been secured in adjacent counties in the coastal plains through soil conservation districts furnishing technical assistance only.

The Upper West Red River Soil Conservation District, Mansfield, La., expressed the view that additional assistance would be required to solve its drainage problems:

"Drainage is a problem about which the district is concerned, and will continue to be concerned about until it is solved. Through the Soil Conservation Service, demonstrations on drainage were put on during the year. The results secured in production increases are unbelievable in many instances. Mr. Roach appeared before the board on one occasion, reporting on the drainage done on his farm. According to Mr. Roach, it meant the difference between a bumper crop and a complete failure. Several other farmers have made similar statements regarding drainage.

"Drainage requires such a large expenditure of funds, the use of such heavy machines, and involves so many other problems that it is the opinion of this board that it will be impossible for the district to carry out the program as it should be until financial assistance from outside sources is supplied."

Along the same line is the report of the Potomac Valley Soil Conservation District, Moorefield, W. Va.:

"We hope to get heavy equipment to construct diversion ditches, farm ponds, drainage ditches, and stream channels. Under present operating conditions, a major portion of the cost of operating this equipment must be borne by individual farmers. While some of our cooperators, both present and anticipated will be able to finance this operation, we believe there will be many of the low income group who can not reasonably be expected to bear the entire expense. It may be that we will have to find some way to supplement the expense of such operations."

Interest in farm drainage is increasing. An example of district interest in shallow V-type ditches is shown by the report from the Richland Creek Soil Conservation District, Barbourville, Ky.:

"The Supervisors are of the opinion that the 409 acres of wet land reclaimed by the District in 1943 was its greatest contribution to the farmers in this district. This was accomplished largely by constructing open V-ditches. . . . Approximately 25,000 feet of this type ditches were built during the year, having an average depth of about two feet, and side slopes flat enough for the farmers to keep them clean with a mowing machine.

"Most of these ditches are designed to do two things: first, to dispose of surface water, and second, to intercept and dispose of seepage water. In most cases they seem to be doing this very well. For instance, the W. N. Adams farm where we built about 600 feet of ditch was visited two or three days after a rain. A slightly depressed area, which heretofore had been a marsh all winter long, was firm and had no water standing on it at all. Also a stream about the size of a man's wrist was flowing in the bottom of the channel. This flow was 100 percent seepage since there was no surface water entering it anywhere.

"Some very encouraging results have been obtained through the use of tile. In several cases production has been increased from about one-half ton of wild hay per acre to 60 bushels of corn in one year."

The Limestone Valley Soil Conservation District, Chatsworth, Ga., reports on farm drainage accomplishments:

"The Supervisors adopted a surface drainage practice in the district this year and 1,000 acres or more has been properly drained on the cooperators' farms."

Grand Coteau Ridge Soil Conservation District, Opelousas, La., reports:

"During the latter part of the year a survey was made on 20 farms on which all or nearly all planned practices were in effect for two or more years. This survey revealed that production had been increased 40 or more percent on these farms. Below we quote some of these farmer cooperators.

"Mr. Sidney Hollier, Lafayette Parish, stated that he made one bale of cotton on 20 acres and didn't harvest any corn on 15 acres in 1940, made 3 bales of cotton, 105 bushels of corn in 1942. Mr. Hollier stated, 'All of my low yields were from lack of drainage. I had made up my mind to quit farming this 50-acre farm if I couldn't get my land drained. In 1943 a drainage program was planned for my farm. The drainage work was completed in June. On the same land as above I harvested almost 21 bales of cotton weighing 500 pounds net and 375 bushels of corn in 1943. Of course the season was some better, however, if these drainage ditches had not been there I would have lost my entire crop as happened in previous years."

"Mr. A. C. Reed, President of the Evangeline Bank and Trust Company of Ville Platte, Evangeline Parish, in a letter to the chairman of the board of supervisors said, 'The soil conservation work completed under the supervision of the Grand Coteau Ridge District in this parish has impressed us very much. This work as well as the display placed in our lobby has educated our people to the benefits to be derived from increased production resulting from terracing, drainage, and other conservation work. As you know, a large percentage of the farms in the fourth and fifth wards will be eroded beyond reclamation unless they are terraced in the near future. In the flat sections of the parish we have drainage problems to be met. Both the terracing and drainage work should be attended to without delay if we are to grow the crops so much needed by the world."

The East Central Oklahoma Soil Conservation District reports:

"There are several thousand acres of fertile land in the bottoms of the Arkansas and Canadian Rivers that would be highly productive if there were adequate protection from floods and surface drainage. Some drainage work has been done, and some special drainage surveys have been made, but accomplishments have not been great because sufficient equipment was not available. Approximately 1,196 acres have been drained. Approximately 600 acres of this drained land in the Blaine and Saylor bottoms in Haskell County produced a crop of fall spinach yielding up to three tons per acre. We expect to do more of this type of work during the coming year."

There is great interest in drainage in many soil conservation districts in the northeastern States with special interest and activity in numerous districts, especially in Maryland, Delaware, Vermont, and New York.

The Ontario County Soil Conservation District, Canandaigua, N. Y., reported as follows:

"The urgent need for food production led to adoption of a policy at the beginning of the year to expend every effort toward that end. Ontario County has thousands of acres upon which drainage systems, open and tile, have been installed. The effectiveness of many of them has been seriously impaired due to siltation of the outlets from erosion. This condition is so extreme that many areas of former cropland have been relegated to pasture or even abandonment. Others are subject to flooding and drowning out of crops, making production a hazardous undertaking. In war time especially it is unwise to risk crop loss and waste human effort and machinery. At other times it is also uneconomical. This situation is significant when it is realized that our very best land is unavailable for needed high value crops. It is roughly estimated that there are more than 100 miles of outlet drainage channel in immediate need of this attention. At least 10,000 acres of rich land would be benfited to the extent of being made suitable for cash crops, the gross value of which at present farm prices and at only average yields would exceed $2,000,000. The district, therefore, directed most of its energies toward drainage as the most extensive way of getting more food and feed quickly.

"Typical of the increased yields and help to the war effort is the Fish Creek drainage project at East Bloomfield. The estimated benefit for rehabilitating a 3-mile channel constructed by a drainage district in 1916 was more than $80,000 worth of increased production. This was made possible by an overall investment by all parties concerned of approximately $8,000, not including technical time. This project involved almost 450 acres of land, one-third of which is muck.

"Planning and construction of drainage projects has given this district an opportunity to utilize group approach unlike any other activity so far undertaken. It is the one problem in which neighbors have a common interest and must get together for solution. Moreover, it has increased contacts with landowners who may be in position to adopt other conservation measures. Drainage focuses attention on the results of erosion, siltation of the farmer's own land. To do something about it now and to make provisions for maintenance automatically calls for an admission that these rich soils have erosion. No better demonstration of the extent and cost of erosion could be asked for than ditches acting as catch-basins at the foot of sloping land. That is a very significant point in an area where the seriousness of soil washing has been overlooked. Only when landowners recognize erosion will they desire to do something about it. Thus, in drainage work it appears we have an excellent educational tool as an important by-product."

GONE WITH THE CLOUDBURSTS

(*Continued from page* 127)

May-June storms. The productive conservation way of farming demonstrated that it:

1. Helped hold the soil on the slopes and hillsides.
2. Eliminated the necessity for reworking the seedbed and replanting.
3. Enabled farmers who contoured to get the upper parts of their slopes planted while the lower parts were still too wet to work. In contrast, farmers who planted rows up and down hill waited till whole fields dried out.

But I think the biggest lesson the storms impressed on thousands of farmers was the need for a complete program of soil conservation and water management. Under the stress, the single practice couldn't be depended on to do the job.

Think of the way the farmers themselves are working together to protect their land. All over the country they have been organizing soil conservation districts with really amazing speed. In these districts, farmers are cooperating under their own leadership to safeguard their productive land, to make better use of rain water, and to increase their yields. Today, these districts include more than a third of all the farms in the country.

We must not forget, however, that a lot of work remains to be done. Erosion still impedes our food production program. It still affects a vast acreage of land, more than farmers have yet been able to protect. But I think it is entirely possible to reverse this trend of waste—this loss of soil, rainfall, and crop production—within a few years after the war.—*H. H. Bennett.*

REFERENCE LIST ☆☆

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OFFICE OF INFORMATION U. S. DEPARTMENT OF AGRICULTURE

Investigations in Erosion Control and Reclamation of Eroded Land at the Central Piedmont Conservation Experiment Station, Statesville, N. C., 1930-40. Technical Bulletin No. 873. Soil Conservation Service, with the cooperation of the North Carolina Agricultural Experiment Station. August 1944.

STATE BULLETINS

Ammonium Nitrate vs. Sodium Nitrate as Fertilizer for Cotton from Experiments Conducted at the West Tennessee Station. C. Inform. 71. Agricultural Experiment Station, Knoxville, Tenn. 1944. Processed.

Bindweed Control. Popular Bulletin No. 176. Agricultural Experiment Station, State College of Washington, Pullman, Wash. June 1944.

The Chemical Composition of Forage Grasses from the Gulf Coast Prairie as Related to Soils and to Requirements for Range Cattle. Bulletin No. 644. Agricultural Experiment Station, College Station, Tex. 1944.

Corn Culture: Results from 14 Years Continuous Experiments at the West Tennessee Station, Jackson, 1915-1928; Soil, Oliver Silt Loam. C. Inform. 72. Agricultural Experiment Station, Knoxville, Tenn. 1944. Processed.

Depth and Methods of Planting Winter Cover-Crop Seed in Louisiana. Bulletin No. 375. Agricultural Experiment Station, Louisiana State University, Baton Rouge, La. March 1944.

Experiments With Cotton, Corn, Sorghum, and Soybeans at the Rice Experiment Station, Crowley, Louisiana. Bulletin No. 383. Agricultural Experiment Station, Louisiana State University, Baton Rouge, La. August 1944.

Fiftieth Annual Report of the Minnesota Agricultural Experiment Station, July 1, 1942 to June 30, 1943. University Farm, St. Paul, Minn. 1944.

Gains Made by Cattle on Summer Range in Northern Utah. Bulletin No. 314. Agricultural Experiment Station, Logan, Utah. 1944.

Grass and Grass-Alfalfa Mixtures for Beef Production in Eastern Washington. Bulletin No. 444. Agricultural Experiment Station, State College of Washington, Pullman, Wash. June 1944.

Hemp Production Experiments: Cultural Practices and Soil Requirements. Bulletin P63. Agricultural Experiment Station, Ames, Iowa. 1944.

Inspection and Analysis of Commercial Fertilizers.. Bulletin No. 348. Agricultural Experiment Station, Clemson, S. C. 1943.

Key to Some Colorado Grasses in Vegetative Condition. Technical Bulletin No. 33. Agricultural Experiment Station, Fort Collins, Colo. 1944.

New York Farm Outlook, 1944. Bulletin No. 636. Agricultural Extension Service, Cornell University, Ithaca, N. Y. February 1944.

Oat Varieties for South Georgia. Mimeog. Paper No. 31. Georgia Coastal Plain Experiment Station, Tifton, Ga. 1944.

The Outlook for Waxy Sorghum in Nebraska. Circular No. 73. Agricultural Experiment Station, University of Nebraska, Lincoln, Nebr.

Peanut Production Possibilities in South Carolina. Bulletin No. 351. Agricultural Experiment Station, Clemson, Agricultural College, Clemson, South Carolina, with the cooperation of the Bureau of Agricultural Economics, and Bureau of Plant Industry, Soils, and Agricultural Engineering, U. S. Department of Agriculture. June 1944.

Progress through Agricultural Research. Annual Report, 1942-43. Agricultural Experiment Station, Louisiana State University and Agricultural and Mechanical College, Baton Rouge, La.

The Quarterly Bulletin. Volume 27, Number 1. Agricultural Experiment Station, Michigan State College, East Lansing, Mich. August 1944.

Sedges and Rushes of Colorado (Grass-Like Plants). Technical Bulletin No. 32. Agricultural Experiment Station, Fort Collins, Colo. 1944.

Soil Treatments for Winter Wheat: A Summary of Field Experiments. Bulletin No. 503. Agricultural Experiment Station, Urbana, Ill. 1944.

Statistical Investigations of Farm Sample Surveys Taken in Iowa, Florida and California. Research Bulletin No. 329. Agricultural Experiment Station, Ames, Iowa. 1944.

Suggestions to Prospective Farmers. Popular Bulletin No. 178. Agricultural Experiment Station, State College of Washington, Pullman, Wash. September 1944.

Sweetclover in Nebraska. Bulletin No. 352. Agricultural Experiment Station, University of Nebraska, Lincoln, Nebr.

Tile Drainage for Increased Production. Bulletin P65. Agricultural Experiment Station, Ames, Iowa. 1944.

Vegetable and Small Fruit Growing in Toxic Ex-Orchard Soils of Central Washington. Bulletin No. 437. Agricultural Experiment Station, Pullman, Wash. 1944.

What's New in Farm Science. Bulletin No. 463. Part II: Annual Report of the Director, Agricultural Experiment Station, University of Wisconsin, Madison, Wis. May 1944.

Every acre that is improved, improves, by that much, the economy of our entire nation. Soil and water conservation provide greater income, more farmer satisfaction, and increased social security on the farm. When the farmer's standard of living is raised, the Government expenditures on farm relief and rehabilitation are reduced. Back of farmer security—back of all human security—must be the security of the soil itself.

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SOIL CONSERVATION

OFFICIAL ORGAN OF THE SOIL CONSERVATION SERVICE

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SOIL CONSERVATION

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SECRETARY OF AGRICULTURE · WAR FOOD ADMINISTRATOR · CHIEF, SOIL CONSERVATION SERVICE

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WELLINGTON BRINK EDITOR

CONTENTS

Front Cover: Cosmos D. Blubaugh, Ohio soil conservation farmer, relaxes with dog, cigar and gun. Mr. Blubaugh's achievements have been noted several times in Soil Conservation magazine, most recently in September 1944. Photographer: George C. Pace.

SOIL CONSERVATION *is issued monthly by* SOIL CONSERVATION SERVICE of the United States Department of Agriculture, Washington, D. C. The matter contained herein is published by direction of the Secretary of Agriculture as administrative information required for proper transaction of the public business, with the approval of the Director of the Budget. SOIL CONSERVATION seeks to supply to workers of the Department of Agriculture engaged in soil conservation activities, information of special help to them in the performance of their duties. Copies may be obtained from the Superintendent of Documents, Government Printing Office, Washington 25, D. C., 10 cents a copy, or by subscription at the rate of $1.00 per year, domestic; $1.50 per year, foreign. Postage stamps, will not be accepted in payment.

They Scout the World

By VERNA C. MOHAGEN

Only a few years ago, three thousand conservationists were among the many enlisted in a national campaign for soil conservation. The Orders of the Day then included planning of farms, surveying the range, setting out kudzu crowns, analyzing effects of rainfall, requisitioning automobile parts in a work group office. Now these three thousand conservationists are scattered over the face of the earth, operating under military Orders of the Day of a vastly different tenor. And while they continue to fight our country's battles from the tundra-covered marshes of the north to the jungles of the tropics, they still find time to observe what these alien shores can teach about the ravages of soil erosion and the age-old struggle for conservation.

That is the theme of a story that can be pieced together from bits of conversations with furloughed men and returning veterans and from letters that have been streaming into the Soil Conservation Service all over the country—letters that are neatly typewritten, notes that are written by hand from remote outposts or hospital beds, and missives penned from fox-holes on inherited Japanese stationery. These notes cannot be classed as scientific treatises on soil conservation, but they do contain a mass of observations of agricultural practices in other countries which reflect an ever-growing appreciation of soil conservation.

The writers are far too busy to be erudite. Lt. Ruel M. Hansen (conservationist, Washington), wearer of the Purple Heart and a few battle stars from campaigns in Africa, Sicily, and Italy, expresses this thought in a recent letter to his reggion: "I've had quite a few occasions to do some fast digging in the soil here but I wasn't too much interested at that time in the soil profile." Conservation aid Glenn McCord of Eden, Tex., writing from the banks of a fox-hole somewhere in the Pacific, must have found time even with all the enemy fire to talk conservation for he ends his short letter with a reference to the "lot of boys" he has met "who are interested in conservation and want to go to work for SCS."

THE NORTH AMERICAN AREA

The locale of the observations our conservationists are sending back to their home base is restricted only by the extent of the far-flung battle line. But the area close to home can by no means be disregarded. Conservationists from Region 1, for example, have had a chance to observe the agricultural practices of Arkansas and Colorado

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EDITOR'S NOTE.—The author is assistant chief personnel management division, Soil Conservation Service, Washington, D. C. She gratefully acknowledges the help of regional personnel officers and others in making available letters and reports for inclusion in this article.

and Wyoming, and conservationists from the Pacific northwest have had equal opportunities in Maine and Iowa and Florida.

Corp. J. W. James (conservationist from Mississippi) while stationed in Colorado wrote home to tell about the "plantings and contouring that had to be made to pin down the shifting sands. . . ." Another corporal (I. N. Parent, farm planner from Georgia) noted with quite apparent pride that "just before passing a tunnel in Nebraska of which both sides appeared to be about fifty feet high and solid rock, there again was kudzu in a perfect green mass."

Third Class Petty Officer John Johnson (peacetime engineering aid in Oklahoma) reports that he hasn't permitted his war-time role of playing the trombone in the Navy band to eclipse his primary interest in soil conservation. He was selected to prepare for the Admiral a soil conservation plan for the base at Bermuda and had the pleasure of seeing the first steps taken in its application before he was transferred.

Across the continent and up toward Alaska and the Aleutians have been still other conservationist observing erosion landmarks of quite a different character. Alaska, the land of promise, made a big impression on S/Sgt. Sheryl A. Nicholas (agronomist from Nebraska). He reported that "although the land was new it showed definite signs of need for conservation" and he adds, "I hope some day to return to Alaska in some capacity of conservation and see what can be done."

"The tundra," says Sgt. Ernest A. Morrell (conservation aid, Kansas) "is a sure-fire soil-conserver and grows even on the steepest cliffs."

THE PACIFIC AREA

Letter after letter characterizes the Pacific area as the "Conservationist's Paradise." Capt. A. L. Sharp (agricultural engineer from Colorado) is convinced that "New Guinea could support literally millions of people." He states that "some of the ranchers in Region 6 would be in a transport of joy could they see the immense areas of grassland cut by clear living streams every mile or two, with shade trees scattered about." Perhaps it was homesickness that caused Edward C. Litel (Wyoming) to deal in comparisons. He found the rich black loam topsoil of New Guinea to be very much like that of Iowa.

Range conservationist Joseph F. Arnold from South Dakota reports that he was thoroughly impressed with the potential possibilities of Australia, a young, undeveloped land. Nowhere did he encounter natural evidence of serious wind or water erosion, but at the same time he saw no examples of conservation practices having been applied to crop production methods.

Another conservationist, Engineer J. R. Wimberly from Fort Worth, observes that the Australian government is becoming interested in range improvement, which, in his opinion, is badly needed.

The May 26, 1944, issue of the "Yank Down Under" gives a prominent place in a news story to conservationist David E. Davies from Wisconsin. Says the Yank: "Davies helped farmers nurse nearly 1,000 acres of corn from seed to ear this year. For a guy from Wild Rose, Wis., getting back on the land and watching the corn grow was pretty much like home."

"New Zealanders have learned not to overgraze their lands as we have done" is the observation made by Lt. (j.g.) Francis Ritz, agricultural engineer from Utah. "Although they have some gully erosion, they don't seem to have very many conservation problems."

From New Caledonia, Lt. Charles H. Lloyd (farm planner from Maryland) reports the existence of "irrigation works" built by natives before the early white settlers arrived but which look very much like the terrace systems SCS engineers use.

Also in New Caledonia, Lt. (j.g.) Samuel Strebin (soil scientist, Region 7) found ample evidences of the desolation caused by uncontrolled erosion: "The island is covered with abandoned farms. Most farms are on 30 to 60 per cent slopes. The present farms . . . are on the steep slopes and no conservation measures are used. After a field erodes too much to farm, they move to another hillside." Some of the farms, he stated, used "bench type terraces and in many cases the level areas were only a few feet wide, extending for thousands of feet around steep hillsides." In another part of the island, Lt. Strebin observed that the "heavy rains cut deep gullies and pile up debris on roads in the valleys below or choke the rivers, "and he concludes his report with "I would like to write a pamphlet on 'Erosion in New Caledonia.'"

From the central Pacific area, Lt. (j.g.) Morris Thurston (civil engineer, California) combines an acknowledgement and appreciation of his promotion in SCS in absentia (simultaneously with his promotion in Navy rank) with a description of a real lesson in conservation and rebuilding — the transformation of a mass of rubble and debris into a base which is there to stay.

In the Hawaiian area, former engineering aid

Stanley Duckworth (Texas), now S 1/c, discovered a rather unique system of hillside irrigation which he intends to investigate more thoroughly if he ever finds time. "Once the conservation bug hits you," says Seaman Duckworth, "it goes with you wherever you go. A countryside is either good or bad; needs terraces, good grassland or over-grazed."

Capt. John Calhoun (soil scientist from Georgia) saw the need for much more work in erosion control on various parts of the islands. He reported, however, "excellent soil conservation practices being put into effect in the pineapple fields and broad-based terraces, meadow strips, and controlled drainage ditches in use." Lt. W. C. Smith (conservationist from Alabama) notes with horror that the farmers burn all of the cane stalks.

Lt. Col. John W. Thomas (drainage engineer from Maryland) reports that he has laid out approximately 75 acres of rubber trees on the contour with contour furrows and that it gave him the greatest of pleasure to "spread the gospel of conservation to a planter in the island wilds."

In the southwest Pacific, Lt. Edwin Keeney (clerk from Burlington, Vt.) "saw lots of erosion but few examples of any effort at good sound erosion control."

Sgt. F. J. Wolf (engineering aid, New York) has studied the grasses, trees, and shrubs of south Pacific islands, helped in his studies by an Australian officer formerly connected with the Australian Department of Agriculture. He hopes that "soil conservation can be included in post-war plans on a world-wide basis." When Nursery Manager Kermit A. Olson (Winona, Minn.), now M/Sgt., landed in Saipan, he promised to be on the lookout for vegetative material that might be of use in conservation work at home.

EUROPEAN-AFRICAN THEATRE

In England, in spite of his duties as administrative officer of a squadron, Capt. Theodore A. Neubauer (agricultural economist from Amarillo) managed to work in a general agricultural course at Oxford. On his trips through the country he has noted that "fields are planned, plowed, and worked irrespective of slope" but feels that the infertile farmland of which he has seen a great deal was probably not brought to that condition by erosion.

From another part of England, engineering aid (now corporal) Marvin Cox of Colorado reports "an elaborate system of soil conservation in the fields—the fields are drained by under-ground tiles, which run into open ditches on the sides of the fields." In still another section, Capt. W. H. Rhodes (horticulturist from South Carolina) found it not "unusual to see rows running up and down steep slopes," and adds with a tinge of sorrow, "I haven't seen a kudzu plant since I've been here—and have found no one who knew about it."

Over in Scotland, Cpl. Hiram L. Swain, farm planner in Georgia, was surprised to find grass growing all the way to the top of the mountains and no appreciable degree of erosion throughout the length of the country.

Forester Robert S. Fisher from North Dakota was intrigued with the history and possibilities of North Africa. "In ancient times," he reported, "the mountains were forested and the land was truly the bread-basket of the Roman empire." Now that successive invasions and careless destruction have wiped out the once great forests, Capt Fisher ponders what a reforestation program would do in a modern era.

Another Captain (Richard D. Butts) reports to his home base in Oklahoma about the "real gully washers" in North Africa and worries about the natives "not seeming to realize that it would pay bigger dividends to farm *with* the terraces instead of *over* them."

Cyril Higginson of the Engineers (formerly farm planner in Colorado) is emphatic that in

North Africa "they certainly could use some of our conservation principles . . . although the irrigated sections seem to have been fairly well taken care of."

Capt. Earl C. McKeel, agricultural aid from Mississippi, salvaged enough spare time during his stay in North Africa to observe "the widespread practice of dry-farming, big dams built for the irrigation of large tracts of land." Lt. Henry Collins (conservationist from Arizona) was also convinced that "there is much to be learned there in the art of conservation and dry land farming." "The systems of water diversion and flood irrigation in use in the high mountains and the utilization of every foot of soil," he states, "make some of our efforts at home look like play."

Lt. Col. Raymond H. Davis (project plans, Washington office) on a flying trip across middle Africa to India and Burma and back over Persia, Palestine, and North Africa, noticed the contouring in Algiers and confesses that he whiled away the time above the continents sketching in the erosion landmarks on a global map.

A conservationist from Puerta Rico, Sgt. Jose Vincente-Chandler, found in north Africa regions "where there is very badly eroded land and gigantic gullies pointing to the need for soil conservation." In these areas, he noted, "all plowing and planting is done as straight as a line of soldiers in 'dress right.'"

"Italy would be helped considerably by an intelligent soil conservation program. They don't know what crop rotation means around here, wheat being raised every year on the same soil. On windy days you can scarcely see for clouds of dust. A few shelterbelts would help this flat country and the mountains would hold much more water if reforested." So prophesies a forester from the Middle West.

Somewhere in Corsica, Capt. W. E. Zimmerman (farm planner, New Jersey) has saved up a number of aerial photographs showing the use of strip cropping, terracing, contour planting of orchards, and drainage as practiced in Italy.

Lt. Roe D. Crabtree, formerly a trainee in Region 7 and hardly well initiated in the conservation program, nevertheless finds time to report that "our biggest problem (somewhere in Italy) is soil stabilization" and that he has observed "some beautifully terraced valleys of orange and lemon groves."

Capt. R. P. Weeber (conservationist from Illinois) reports that the farm advisor's handbook and Stanley Locke's handbook on forestry have been of practical assistance in his work in northern Italy.

S/Sgt. James M. Wise (conservationist from Sunbury, Pa.) is also collecting "somewhere in Italy" pictures of terraced areas and other examples of conservation practices. "Some of the hills," he reports, "are entirely covered from top to bottom with terraces ranging from 10 to 50-75 feet wide and probably not much longer than 300 to 400 feet. They are mostly constructed of stone and so accurately laid out that every drop of rain is caught and put to use."

"Italians follow many good soil conservation practices as a result of their natural love of the land," was the observation of Capt. James A. Wilson, conservationist from Alabama. When he returned to the States, Captain Wilson found that the Southland he had left only a few months ago somehow presented an entirely new picture—a land so new and young compared with the country he had just left—"yet thousands of acres completely ruined."

In France former trainee, A. D. Flores Kruse of Wyoming, now Lt. Kruse, missed the contour-farming of the States but noted that the French farmers did strip-crop and rotate their crops.

Sgt. D. S. Clarke (Region 2) has seen in France, Belgium, and Germany "good examples of grass sod, forested hills, and terraces."

THE ASIATIC AREA

Zone technician Warren Turner of Albuquerque writes from a Fighter Squadron base in China, that "until you've seen this country you don't know the meaning of soil erosion!"

In India, discovered conservationist John Bonomo of New Mexico (now a Lt. at an Air Base), "they are beginning to realize that they must follow a program to build up the soil, if further hunger and starvation is to be avoided. Newspapers," he adds, "advocate soil conservation and large land owners are looking to our system in the States more than ever."

Sgt. James P. Roberts, farm planner from Georgia, observed while on convoy duty "cornfields on sides of mountains that looked to be almost straight up." Without rows or terraces, he explained, "the corn was planted on level areas made by digging out little pocket-like places in the mountainside." He noted that some mountains, as high as the average Blue Ridge Mountains, were terraced all the way to the top but were not cultivated and he learned from an interpreter that the terraces were for holding the water so that it could be caught in the rice fields below.

On a trip in Iran, Sgt. Leonard A. Lyngstad, agricultural engineer, North Dakota, was interested to note that "whole mountainsides are farmed . . . irrigation ditches are made by hand and on such true levels that the whole area looks like a jig-saw puzzle. When they cross a small cut or gully," he states, "they build a bridge to run the water across on and then go around the area and on several occasions come back in the opposite direction and go under the bridge. The network of ditches must have run hundreds of miles, . . . with fields varying from 10 acres to 15 by 30 feet square."

"WHEN IT'S OVER, OVER THERE . . ."

Mr. Johnson of Oklahoma (the one who made the soil conservation plan for the Admiral) is eagerly looking forward to returning to Oklahoma as a full-fledged farm planner.

Lt. Strebin of Region 7 hopes he "can get back into soils work after the war is over" and take part in "a great post-war triumph in conservation."

Lt. B. D. Moser (soil conservationist, Oregon), after averaging 1,000 miles a month of army trucking over the roads of Italy, asks that the Service pick him a place where he "can settle down." He will no doubt be keenly appreciative of the good old American farm tractor, for he reports that he saw "a three-bottom plow with oxen pulling, kids riding, mama at the helm, and the old man coaching."

After reporting on "the enlightening experience to observe (in Malta, Sicily, Italy, India, and China) some of the agricultural practices employed for centuries, some good and some bad," Col. Paul Cunyus, former district conservationist at Mt. Pleasant, Tex., ends his letter with this caution: "Don't get the mistaken impression that this particular farm boy is planning to settle down in one of these countries. America has still got the most of the best."

Former clerk-stenographer Ernest A. Christie from Utah, now Y 1/c in the U. S. Fleet, has already laid plans for attending an agricultural college for four years before returning to SCS.

Lt. Col. Thomas of Maryland writes from Australia that "quite a few ranch owners in Australia would like to have me draw up a conservation plan for them after the war," but he is quick to add, "as to that, I am afraid my first thought will be to get back to the U. S. A."

Lt. Col. Lew R. Good (farm planner from Pennsylvania) votes from somewhere in England "Please count me in the 'aye' corner" when it comes to remaining in conservation work." More concerned at present with "airborne identifications" and "going in," he still fills his few idle moments with books on agriculture and asks for current recommended reading.

Frank Lesesne (soil scientist from South Carolina) looks into the future from an APO address in India and hopes that he can "be assigned the duties of studying and observing the methods of drainage and irrigation with respect to soils and crops in India and parts of China."

Pfc. John Hendricks, (Personnel, Washington office) paratrooper who has dropped from the clouds behind the enemy lines in Africa and Sicily and in Italy, awarded the Purple Heart, confessed during a recent furlough that his life of adventure has insipred him to wonder about possibilities of a career in soil conservation in the frontiers of Alaska. And already he has been counseled about the opportunities for technical education under the G. I. Bill as a welcome prelude to a life-time career.

From an air corps base somewhere on a battle front, Lt. Eamor C. Nord (range conservationist of New Mexico) reports the almost unanimous aspiration "to reach the ranks of civilians as soon as possible and get our fingers back in the soil." But he wonders "can we take academic leave from our jobs with the Service in order to take some refresher courses before entering the work after leaving the Army."

Yes, educational leave will be possible for the GI's returning to SCS who want it. Some will probably wish to take advantage of the government's offer of assistance in furthering their education under the G. I. Bill. But for those who want to return immediately to active participation in the conservation program, plans have already been made for their reception.

As the inevitable aftermath of war, some conservationists will return with battle scars and a doubt in their minds that they can resume their peacetime role in the service of their country. For these the Soil Conservation Service has pledged itself to do all within its power to place them in jobs for which they can qualify. A few have already felt the reality of this policy. Skilled laborer Norbert DeLowery of Region 6, severely wounded at Guadalcanal and demobilized because of his injury, was returned to his former job. When it became apparent that he was not yet physically qualified to carry on his old duties, a search throughout the region for a suitable assignment resulted in his promotion to a guard position in the regional office.

(*Continued on page* 146)

DISTRICTS RIDE THE RANGE

By KENNETH FIERO

Ranchmen are increasingly aware of the importance of conservation. With the assistance of range technicians furnished through soil conservation districts, they are steadily improving the management of their ranges. The Soil Conservation Service is assisting nearly all the 532 districts now organized in the 17 western states. These districts contain more than 300,000,000 acres, well over half the country's district acreage. Most of it is used for grazing.

Assistance to districts is directed toward better forage management. Ranchmen are becoming alert to the importance of maintaining the most productive combination of forage plants. They are asking: Does my range have the right combination of plants for sustained forage production? What is needed to assure the desired composition, density, and vigor?

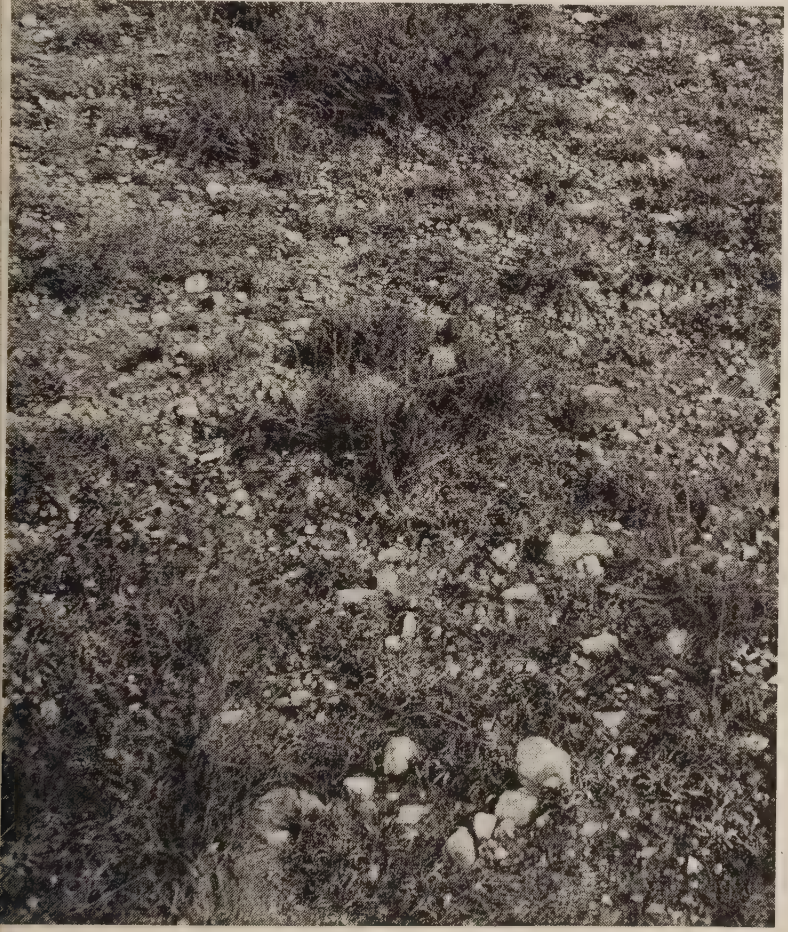
Strictly farming communities have been quick to get districts under way as a means of dealing with the common problem of soil erosion. The ranch country has been somewhat slower to organize its districts, although it has been demonstrated that districts are equally well adapted for coping with the less spectacular erosion problems of the western ranges. Grazing lands, too, are susceptible to the loss of productive capacity. Quite naturally, at first ranchers were dubious about organizing districts for the purpose of engaging in contour furrowing and other forms of structural treatment. Many of these practices were not suitable for widespread application on the range. Today, many of the most ardent supporters of conservation districts are ranchers.

Consider the situation in certain Texas districts. The Highland Soil Conservation District, which covers parts of Jeff Davis and Presidio counties in the Davis Mountain country of west Texas, is an example of a section devoted almost entirely to ranching in which the district is assisting on more than a million acres. The Eldorado Divide Soil Conservation District in Schleicher and part of Tom Green Counties, and the North Concho Soil Conservation District in parts of Sterling, Glass-

EDITOR'S NOTE.—The author is range conservationist, Soil Conservation Service, Fort Worth, Texas.

A range in excellent condition. Here vigorous growth is achieved by an abundance of high-quality plants. The high density of such nutritious plants as sideoats grama, hairy grama, and little bluestem is adequate to hold the soil in place and retain a large amount of the rain or snow for use by the plants.

A range in poor condition. This range has a potential production equal to that in excellent condition. The most desirable plants, however, have lacked an opportunity to manufacture plant food necessary for their maintenance. The less plantable and more drought-resistant plants have replaced the more desirable ones.



cock, Coke, and Tom Green Counties are further examples of predominantly range districts that are dealing effectively with conservation problems on ranch lands.

Ranchmen know that ranges supporting the highest quality and quantity of forage will lose a minimum of soil and water. Hence, the initial step for improving forage resources is to ascertain the condition of the range. The condition of the range is determined by the abundance of high-quality forage plants in a vigorous growth, or the

A range in good condition. The better plants still make up a high percentage of the composition, but density and vigor are generally lower than on ranges in top condition. The taller grasses have given way to those that increase under grazing.

absence of these high-quailty plants with the attendant low-value plants. For the purpose of comparing ranges that are generally similar with respect to soils, topography, moisture, and temperature, "excellent" is used for the top condition; "good," "fair," and "poor," in descending order, reflect the extent to which ranges deviate from the top condition. Thus, the range in excellent condition produces the maximum forage of high nutritive value, and the plant cover is adequate to hold the soil in place and efficiently utilize the rainfall. It is characterized by an abundance of high-quality forage that more nearly fulfills the nutritive requirements of livestock grazing the range. In contrast, a range in poor condition is dominated by low value shrubs, perennial weeds, and annual plants. There is little resistance to erosion, and runoff is very rapid. Generally, the silt load of run-

off water from such a range is extremely heavy.

A range in "poor" condition produces considerably less high-quality forage than a range in top condition. Yet, this range is capable of being improved to the same level of production represented by a range in "excellent" condition.

The classification of a range is a fairly accurate indication of its productive capacity along with the measures and management practices necessary to improve or maintain the range in "excellent" condition. In arriving at such classification, the combined knowledge and experience of the ranchmen and technicians are directed to developing management plans that will maintain maximum yields of forage.

Every rancher is interested in maintaining the more desirable forage plants, but in many cases such less desirable plants as needlegrass, burrograss, fluffgrass, muhly grass, broomweed, and bitterweed have replaced the more palatable plants. The district provides a forage inventory that reflects the kinds and amounts of desirable and undesirable plants. This is highly important in planning future management.

Plants, in common with other living things, have essential requirements for growth. In addition to moisture, plant nutrients, and temperature, they must be allowed to retain foliage to manufacture plant food. Rest periods during growth are a practical means of giving plants an opportunity to manufacture plant food and to produce the most forage. These rest periods, along with leaving enough of the plant to facilitate absorption of the precious rainfall and to protect the soil against evaporation from hot, drying winds, are mandatory for highest forage production.

By careful observations, ranchmen and technicians to some extent have developed methods of utilizing the undesirable plants for livestock production, while at the same time restoring the better grasses and weeds. Excessive quantities of weeds and annual grasses may be grazed to advantage when they are succulent, provided the livestock are removed immediately after the harvest of the annuals to give the desired grasses the advantage of rest during their growth period.

In addition to classifying the condition of ranges and assisting ranchmen to develop management plans, the district assists with forage utilization surveys. These are made to determine the degree of use made of the range, and serve as a basis for estimating the amount of the current year's forage left on the range. The rancher applies this information to determination of adjustments in the management plan or the rates of stocking. In the range country, the major portion of range forage is produced in comparatively short seasons. On a well managed range, forage is generally adequate for livestock during the growing season. The periods between growth are most critical from the standpoint of adequate foliage to protect the soil, to conserve moisture, and to meet livestock requirements.

Utilization surveys supply the rancher with information that will lessen the hazards of grazing during the time the forage species are dormant. These surveys are generally made in the fall. With knowledge of available forage, adjustments in livestock numbers can be made at the normal marketing season. The utilization survey enables the rancher to adjust livestock numbers upward or downward in relation to available feed resources and thus market his livestock in good bloom and prevent damage to the forage plants.

THEY SCOUT THE WORLD

(*Continued from page* 143)

For reorientation in the technical and administrative progress of the conservation program at home, conservationists returning from their wartime jobs will be given 1A priority for assignment to the technical short-term training schools already in operation or being set up in every region of the Service, now being utilized almost wholly for the preliminary training of new recruits.

In Region 3, where the training school (LaCrosse, Wis.) has been in operation the longest, six conservationists, veterans of World War II, have already been "graduated." One of these Hjalmer Johnson of Minnesota, formerly CCC camp superintendent, spoke of his completed course as "one of the finest courses that he could ever have taken to get back into the soil conservation work and do his duty as an engineering specialist working on farm plans," and the same kind of enthusiasm is reflected in the expressions of the other "graduates."

As time goes on, many other conservationsts will be returning from distant places. They will be welcomed as reinforcements to the ranks of the conservationists at home, to drive forward together in the homefront crusade.

CHOSEN "MASTER CONSERVATIONIST"

In Kentucky recently, the Hardin County Soil Conservation District and the State Soil Conservation Committee designated R. R. Hughes as "Master Conservationist" and honored him by a public celebration at the county seat.

LAND UTILIZATION
past ...... present ...... future

Community pasture, Hector, N. Y., land utilization project.

By E. G. GREST and W. F. DICKSON

The basic idea of the land utilization program of the Soil Conservation Service grew out of research studies in the Bureau of Agricultural Economics and a number of state universities and experiment stations. In 1929, Congress recognized the growing need to do something about submarginal land when it authorized the Federal Farm Board to investigate the possibility of reducing the acreage of unprofitable marginal lands in cultivation. Some of the first proposals involved the removal of submarginal lands from production by purchase to offset the increased production from new reclamation projects.

Editor's Note.—This paper formed the basis of a discussion before the operations seminar of the Soil Conservation Service, Washington, D. C. The authors are the Chief and Assistant Chief, respectively, of the Land Utilization Division.

CHRONOLOGY

In the beginning, the land program was established as a public works program primarily, with the secondary purpose of retirement of submarginal lands from cultivation. There was also brought into the picture the idea of working out an adjustment of the agriculture of an area on a sounder basis.

The first allotment of funds, made available in February, 1934, totalled $25,000,000. From then until April 30, 1935, the program was administered by the Federal Emergency Relief Administration. In August, 1934, an allocation of $53,390,000 from drought relief funds was made, and more was promised. Just when options were rolling in from projects, virtually by the truckload, $50,000,000 of drought relief money was withdrawn in March, 1935. Subsequently, however, $20,000,000 was made available from Emergency Relief Appropriation funds. Thousands of options given and taken in good faith could not be accepted. A staff of letter writers was kept busy for many months answering letters objecting to cancellations or failure to accept options. There are still plenty of people stranded on poor land who would like the Government to buy their lands and help them off to a new start elsewhere.

In December 1935 an initial allotment was made of $15,000,000 WPA funds to carry out improvement work on the projects. The allocation and withdrawal of funds, changes in procedures, etc., made for "never a dull moment" for the next three or four years.

From April 1935 until October 1938, the land utilization program was successively in Resettlement Administration, Farm Security Administration, and Bureau of Agricultural Economics. The land utilization program was given Congressional recognition when the Bankhead-Jones Farm Tenant Act became law in July 1937. The reorganization of the Department in October 1938 placed the Land Utilization Program in the Soil Conservation Service. During a life span of nearly 11 years, 6 years have been spent in the Soil Conservation Service.

In the beginning, there were four types of submarginal land purchase projects:

(1) Lands largely within Indian Reservations, these projects being planned by the Office of Indian Affairs; (2) lands acquired for wildlife refuges by the Biological Survey; (3) lands for recreational purposes approved by the National Park Service, and (4) agricultural demonstration projects.

These four purchase programs were coordinated when the Resettlement Administration was established by Executive order in 1935.

Altogether, over 11,000,000 acres were purchased. The largest acreage was in agricultural demonstration projects amounting to 9,500,000 acres, 750,000 acres in Biological Survey projects, nearly 1,000,000 acres in Indian projects, and almost 400,000 acres in National Park projects.

Of the 9,500,000 acres in agricultural demonstration projects, 1,000,000 are managed by state agencies under long-term leases, 1,750,000 were transferred to other Federal agencies for administration, including over 1,000,000 acres to the Forest Service, and lesser amounts to the Fish and Wildlife Service, War and Navy Departments, Indian Service, Grazing Service, and the National Park Service. This left nearly 7,250,000 acres to be administered by this Service under title III of the Bankhead-Jones Farm Tenant Act.

Let's take a look at some of the more important improvements made on the land now under the administration of the Soil Conservation Service. Some 723,000 acres have been seeded or sodded, 8,300 miles of new fences have been constructed, 2,913 miles of old fences purchased with the land have been repaired, nearly 4,000 dams, springs, wells and dugouts were constructed or repaired to provide water for livestock. Of the 607,000 acres of land in timber production, over 48,000 acres have been planted to trees since the lands were purchased.

About 16,000 acres are used for recreational purposes, with cabins constructed on 13 different projects, group camps on four projects, and 83 separate picnic areas.

In keeping with the Service's efforts to encourage the dedication of every acre to the use for which it is best adapted, nearly 27,000 acres have been fenced out for wildlife, and 98 ponds for wildlife have been constructed. Appropriate land use practices have been adopted to encourage wildlife.

There were over 12,000 families living on the land acquired in connection with agricultural demonstration projects. A large number were tenants. Although a complete report is not available, sufficient checks have been made to know that most families are better located to make a living than formerly.

The farmers and ranchers who use the land owned by the Government are the ones who have received and will continue to receive the greatest benefit from the program. Nearly 8,000 permits were issued during 1943 authorizing the use of lands under the administration of the Soil Conservation Service for grazing, cropping, haying, timber harvest, seed harvest, and a few other miscellaneous purposes. In addition, nearly three-fourths of a million people have used the recreational facilities.

The projects classified the farmers and ranchers receiving permits into three groups. Of 6,036 op-

Timber operator skidding logs on the land utilization project in Bradford County, Pa.

erators, it was reported that 1,109 did not require the permits they received in order to make an adequate living, 2,702 needed the permits to make an adequate living, and 2,222 required larger permits. Some of this latter group will receive larger permits and will be lifted into the middle group as more of the land is brought into production and as that which is in production becomes more productive. Some of the groups not needing permits to provide an adequate unit are holding temporary permits which will be reduced as the smallest permit holders are able to expand operations.

Not only are these operators benefiting by the privilege of using the acquired lands, but experience has shown that it is easier to get conservation practices initiated on the privately owned land and other lands they control.

In many areas, much is accomplished by example. In others, the main factor is the ability to shift to a less intensive type of agriculture because more land is available to operators. The security of tenure achieved through use privileges and the leasing and management programs of local organizations, such as State grazing districts, grazing associations, and soil conservation districts, has also contributed tremendously to the desire on the part of farmers and ranchers to use all lands properly. Our aim is for all permittees to use the other lands they control in accordance with good conservation practices. We think this objective can be reached through educational processes.

In discussing the accomplishments of the program, the public works aspects should not be overlooked. During the time when employment was so very pressing over $60,000,000 was spent on improvements. This money provided work for men on relief and many a man was able to provide food and clothing for his family through wages received on these projects. Particularly noteworthy is the fact that many rural people on relief were given employment which would have been difficult to obtain otherwise. As an additional by-product, a large number of men learned skills which helped tremendously in obtaining regular employment as carpenters, masons, mechanics, and bulldozer operators.

Twenty-five percent of the receipts from fees for land use are returned to the counties, in lieu of taxes for school and road purposes. It is recognized that this payment is not always equitable, particularly during the first few years of public ownership when receipts are low. Legislation has been recommended by the Department of Agriculture to provide for certain guaranteed minimum payments which would satisfactorily meet that problem. Even without this legislation, the record is not too bad. In some instances the counties were able to bring about savings in expenditures through the consolidation and closing of schools made possible by land purchase. Roads were closed. Large sums in delinquent taxes were paid to the counties out of the purchase price of the land at the time title passed to the United States; these helped many counties to retire debts and get on a sounder financial basis.

In 1943, the total receipts from use permits amounted to around $450,000, and it is anticipated that at least $500,000 will be received for 1944. This is almost equal to the amount spent for management.

HIGHLIGHTS OF SERVICE POLICIES IN MANAGEMENT

The use which may be made of Title III lands is rather definitely laid down in Title III of the Bankhead-Jones Farm Tenant Act and Department policies.

The law states: "The Secretary is authorized and directed to develop a program of land conservation and land utilization, including the *retirement* of lands which are submarginal or not primarily suitable for cultivation, in order thereby to correct maladjustments in land use. . . ."

The Secretary of Agriculture stated the Department policy as follows: "The term 'retirement' used in the Act clearly implies shifting land which is submarginal in its present use or not primarily adapted to cultivation, to a use for which it is physically and economically better suited. . . ."

Service policy, therefore, provides that purchased lands formerly in cultivation will be devoted to a less intensive use, such as for range, pasture, woodland and wildlife.

USES

Over 82 percent of the LU land is used for grazing, or a total of 5,885,000 acres. Another 400,000 to 500,000 acres will also be used for grazing as soon as it can be seeded. This will make nearly 90 percent devoted to grazing.

About 8.5 percent or 607,000 acres is in timber production, some of which will need planting to speed up the process of transition to desirable timber stands.

The rest of the acreage, about 100,000 acres, is used for cropping, hay production, recreation, wildlife, and miscellaneous uses.

The objective of management is to provide that Title III lands supplement the privately owned lands of nearby farmers and ranchers to the end that the whole agricultural economy of the area is made more secure. The policies guiding the distribution of use privileges are designed to assist the smaller farm or ranch operators to achieve at least a minimum-size economic unit.

Management responsibilities are carried out first, through direct management by Service personnel, and second, through local land management agencies. The latter is preferred.

Over 4,000,000 acres of grazing land is managed through 25 cooperative grazing associations and three soil conservation districts. In addition, three soil conservation districts manage small acreages of Title III lands.

The grazing agreement entered into between the Service and the local agency is essentially a lease which sets forth the principles under which the land is to be managed. The Service retains authority to establish fees, set the seasons of use, determine the qualifications of applicants, determine the manner in which permits are granted and, together with the association, determine the grazing capacity and rate of stocking for all lands controlled by the association.

The association or district issues permits, collects fees, establishes commensurability standards, rules of the range, settles disputes between members, maintains fences and stock water facilities, and in general carries out all the details of land management under the guidance of the broad policies laid down in the agreement and in specific Service instructions. The people have a voice in carrying out their own program, and the Service is relieved of the responsibility of settling disputes between neighbors.

The Service would like to see all Title III lands managed by local groups, but there are some of the "old program" projects which do not at this time seem adapted to such management. These include projects where forestry predominates or where recreation is important.

Grazing privileges on the range projects are distributed on a preference system. A preference is expressed in terms of the number of animal units the permittee is qualified to graze on government lands (or government and association lands) during the grazing season. A preference remains in effect so long as the holder controls the feed base and other land on which the preference is established and abides by the terms of his permit. The essentials of the system are as follows: In order to qualify for a preference, an applicant must be a farm or ranch owner or operator, must live within the project area, and must be a citizen of the United States. After meeting these requirements, the size of an applicant's preference is based upon the number of head of livestock his owned and leased feed-base lands are capable of maintaining for a period of four to six months, the number of head of livestock he previously grazed on lands subsequently purchased, and the need for grazing either to secure proper use of his feed-base lands or to provide additional grazing to increase the size of his operating unit.

Predicated on the number of animal units for which the applicant has established a preference, a permit is issued each year to cover the number of animal units which may be grazed each season. As a result of this system, operations are stabilized; each preference holder knows that each year he can depend on a definite amount of grazing on government lands.

The Weld County project in northern Colorado is a good example of the results of the purchase of lands submarginal to farming and of overgrazed lands, the consequent improvement through range

Stock do not have to travel more than 2 miles for water on the Briggsdale, Col., land utilization project.

seeding, water development and controlled grazing, and the stabilization of use through a system of preference permits.

Let us examine the area within this project now managed by the Crow Valley Cooperative Livestock Association. In 1935, the community was largely on relief. Thirty percent of the land was subject to tax sale. Of 22,000 acres State land, 6,700 were not leased. Seventy thousand acres of plow land were blowing. Range lands were overgrazed due largely to the fact that from 2,000 to 3,000 "day herd" cattle and horses were grazed in trespass in this area. The calf crop averaged about 60 percent and the average operating unit was 360 acres.

In 1940, no persons were on relief, all tax sale land had been redeemed, all State land was leased, out of 70,000 acres of blowing land only 500 were not completely stabilized, range forage production had increased due to controlled grazing, the trespassing stock had been removed, land was leased on the basis of its grazing capacity, the calf crop had increased to about 90 percent, and the average size operating unit had increased to 1,950 acres.

In the East and South distribution of use privileges presents a number of problems not encountered in the West. In the West, the pattern of land purchase was designed to facilitate adjustments in operating units and consequently the lands acquired were largely scattered among operating units. In the East, the public works aspect of the land purchase program was foremost with the result that lands purchased were largely blocked up. The farmers who could benefit from the development of pasture, for example, must come from outside the area, rather than from within, as in the West.

We are now working with the four Eastern regions to establish a priority system to select farmers qualified to receive grazing privileges on government pastures. Under our tentative procedure, applicants whose farms adjoin or those living closest to pastures, who *need* supplemental grazing privileges, will be given priority over those living at a great distance.

The second most important use of Title III lands is for timer products. Service policies provide for disposal of timber products by permit or advertised sale. Wood cutting permits are distributed on a priority basis. First priority goes to persons living in or near the project who need wood for fuel, fence posts, poles, lumber or other domestic uses. Second priority goes to applicants living within or near the project area to provide a supplementary income. Third priority includes all other applicants.

Where the amount of timber to be removed is greater than can be cut under permits or where there is no demand for permits, it can be sold to the highest bidder.

The objective of all timber sales at this time is, aside from a desire to contribute to the war effort, primarily a means of cleaning up the woods in order to leave a thrifty stand of growing timber.

Recreation constitutes a minor use. The Service maintains some picnic areas and any development of new recreational areas is restricted to picnic areas for day use.

It is worth noting that the opportunity provided for recreation on the 6 water conservation projects in the Panhandle of Texas, and on the 14 lakes constructed on these projects, including Crab Orchard Lake in Southern Illinois with a surface acreage of 7,000 acres—the largest body of water

in that State—afford probably the greatest opportunity for recreation available to hundreds of thousands of people.

The policy of the Service relative to wildlife on LU projects is stated as follows: "The principal objective of the Service with reference to wildlife will be the development and maintenance of suitable wildlife habitats consistent with sound land use practices." The hundreds of stock water reservoirs constructed on LU projects in Montana and the Dakotas have furnished nesting grounds to a very significant number of ducks each year. Many LU projects have been used to provide testing grounds and demonstrations of wildlife planting.

OUTLOOK

At one time, it was estimated that there were 76 million acres of land in cultivation which should be retired. Some 11 million acres were purchased under the submarginal land purchase program. The now discontinued National Resources Planning Board recommended the purchase of 20 million acres of submarginal lands along the eastern seaboard. The conservation needs survey has indicated that some 46 million acres of land should be retired to less extensive uses.

The field in which there is a real need and an opportunity is in connection with the district program. The Secretary's memorandum of September 25, 1937 had this to say:

"A program of acquisition of submarginal farm land cannot be fully effective in correcting maladjustments in land use unless corollary measures are taken by Federal, State, and local agencies and by farmers themselves to guide land use into desirable channels.

". . . Special consideration will be given to the purchase of submarginal farm lands:

"1. Where such purchases, in addition to meeting the requirements of Title III, will also forward other land use programs with which the Department is concerned, such as, for example, the programs of soil conservation, . . .

"2. Where the land use adjustment objectives of the program will be extended to related lands not purchased under the Act, through the application thereto of other Federal, State, or local measures for conservation control, as, for example, in:

> "Areas where soil conservation districts have been organized or have petitioned for organization."

Therein lies an opportunity for the Service to bring another big gun to bear upon its objective, the stopping of erosion, and at the same time work out some economic adjustments in nearby farms through making pasture and timber available.

At the present time the Service is cooperating with more than 1,100 soil conservation districts. We have seen, as on the Honey Hollow watershed, that the ultimate goal must be a complete conservation plan covering every acre within a watershed.

In almost every district, if not in every one, there are farms or idle lands which must be placed under a conservation plan if the over-all conservation program is to succeed. This is where the authority to acquire lands can be used to high advantage.

The need for acquisition of submarginal lands in order to carry out a conservation program was recognized by the National Resources Planning Board. Its report of September 1942, stated that ". . . a rounded program for soil conservation, erosion control, and run-off retardation would require the public acquisition of submarginal lands. . . . The continued cropping of lands unsuitable for cultivation results in further destruction of the soil resources and may affect the value of other, and frequently more valuable, lands. The families attempting to make a living from such lands generally have insufficient resources to carry on a soil conservation program on their farms. They are usually unable to make the shift to proper land use; for instance, from cash-crops farming to grazing, and still secure a living from their farms. . . . It is often possible, . . . through the acquisition of relatively small acreages, so to change the pattern of land use and occupancy as to enable a substantial proportion of the families to build up operating units capable of supporting a family after allowing for soil maintenance."

The Chief stated in *Soil Conservation* magazine (February 1940) that "In terms of land utilization we have expanded our thinking and our action from promoting sound land use on individual farms to carrying out improved land-use programs over large areas that include groups of farms and much land that is not, or should not be, used for cultivation. . . . Of course, the purchase of land is merely a means, not an objective, in the program. . . . Specifically, there are few, if any, areas in which conservation of the land can be achieved only by working on individual farms. Sooner or later, in many farming areas of the United States, we reach the point in erosion control work beyond which it may not be possible to produce the necessary results. It may be that some farms, for example, are too small for the type of agriculture

1944 NATIONAL SAFETY AWARD

When Howard H. Wilson, regional Soil Conservation Service safety engineer, was presented with the winner's plaque at the National Safety Congress in Chicago early in October, it marked the third consecutive year in which a Service fleet has been awarded this outstanding honor in the National Fleet Safety Contest. In 1942 and 1943 champion Service fleet was that of Region 2, Spartanburg, S. C.

The Soil Conservation Service Region I with headquarters at Upper Darby, Pa. won the country-wide inter-city trucking contest, in which both private and governmental fleets competed. The region's trucks traveled 1,375,000 miles during the year without so much as scratching a fender.

Special certificates were also awarded to the following regional Soil Conservation Fleets:

Region 1, Upper Darby, Pa., for placing in the top 20 percent in the Group 2 Passenger Car Contest.

Region 2, Spartanburg, S. C., for placing third in the Group 2 Passenger Car Contest; also, for placing in the top 20 percent in the Private Inter-City Trucking Contest.

Region 3, Milwaukee, Wis., for placing in the top 20 percent in the Group 1 Passenger Car Contest.

Region 7, Portland, Ore., for placing in the top 20 percent in the Group 1 Passenger Car Contest.

that will conserve the soil and at the same time support a family. On the other hand, there may be farms on which so much land is classed as unsuited to cultivation that it is rightly termed "submarginal." Here is where the land utilization approach steps into the picture.

The Board of Supervisors of a soil conservation district is the logical group to designate lands which would need to be purchased in order to carry out a complete conservation program in a district. Such a program of public land acquisition based upon the need of acquiring non-conforming lands in order to carry out a complete conservation program in an area would be in furtherance of Title III.

The wholesale acquisition of lands is not suggested but only of tracts scattered here and there through a district when there is no other way to handle these lands and public acquisition is the last resort.

Certain work unit leaders and district conservationists are already thinking along these lines. In one area in Oklahoma, characterized by small holdings and sandy soils, where crop production is a high risk type of agriculture, the work unit leader is building up a card file in which are listed those farms which are too small to maintain a family, with the hope that some day funds will be available to purchase these lands and convert them into community pastures.

In Whitfield County, Ga., where the LU project is contained within a soil conservation district, the location of each cooperator is marked on a map. Asked why practically all of the cooperators were grouped in the area in which the Title III lands are located, the district work unit leader replied that, first, the work of establishing pastures, sericea and kudzu, on lands formerly in cultivation, served as a demonstration of proper land use and second, that it was easier to write a farm plan where provision could be made for supplemental pasture or for additional hay. He went on to say that he could draw up a much better farm plan in such cases, than where the plan had to be confined to the farm's own small holding. The district conservationist, who has five work units under his supervision, remarked that he wished he had a land utilization project in each of his work units. This serves to emphasize the fact that the Service has in such a project one more tool which can be used to assist soil conservation districts in stabilizing farm soils and economy.

A LOOK AT ETHIOPIA

By A. T. SEMPLE

Tree-crotch hoes with steel points break the soil 200 miles south of Addis Ababa, were mulch tillage is a common practice. The soil is so full of humus that one could work it with bare hands.

Who has not heard of the fertility of the Valley of the Nile? For thousands of years the flood plains of the Nile have been enriched by soil carried two thousand miles or more through the desert from the highlands, where rainfall is abundant. One main tributary of the Nile, known as the Blue Nile rises in Lake Tana in Ethiopia. For several hundred miles after leaving the Lake, the water flows through a deep canyon which dissects a fairly level plateau with an elevation of approximately 8,000 feet.

In places this plateau is broken by rugged mountains 12 to 13 thousand feet high. Even steep mountainsides with slopes up to 100 percent are intensively cultivated. The people shun the warm tropical valleys, where malaria is present, and cling to the cool and healthy highlands.

There are millions of these plateau and mountain people in Ethiopia. With a yoke of humped zebu oxen and a wooden plow, they cultivate about 10 acreas per man or 5 acres per ox. The soils are principally black brown or reddish brown clay loam or clay, developed from residual material. In many places stones occur on the surface and imbedded in the soil. The principal crops are teff, maize, grain sorghums, barley, wheat, flax, cotton, peas, and neuk. The latter is a small black seed from which a very palatable oil is extracted. An annual grass known as teff produces a very fine seed which is ground between stones and made into cakes resembling our buckwheat cakes. This is

EDITOR'S NOTE.—The author is principal animal husbandry specialist, American Technical Mission to Ethiopia, Foreign Economic Administration.

one of the staple foods of the country, and great quantities of maize are also eaten.

In such a watershed that has been cultivated for many centuries, what keeps the good topsoil in place and prevents the subsoil from coming down to bury the rich valley land of Egypt?

In the first place, most of the fields are small and contain less than 5 acres. Most of them are laid out approximately on the contour. With the use of crop rotations, and through a great variety of crops, an effect somewhat comparable to that of contour strip cropping is attained. Much of the plowing to prepare the land for seeding is also on the contour. The land is usually plowed twice before seeding and much hand work is done to destroy the weeds and to remove chunks of grass and rhizomes. The land is never harrowed. All seeding is broadcast by hand. The wooden plows have only a small iron or steel point on the end of a stick running through the rear end of the crooked pole beam. The upper end of the stick serves as the handle for the plow. Above the point of the plow there is a sharp V-shaped frame which tends to loosen the ground but there is no moldboard effect to turn it over. Thus, the topsoil is not turned over, and the grass roots and crop residues remain on top to increase the rate of rainfall absorption and reduce the speed of water that may start to run off. The rough unharrowed surface also facilitates absorption.

With broadcast seeding and practically all hand cultivation or weeding where such treatment is necessary, there are no rows up and down hill to form ditches to hurry soil-laden water off the fields. Neither are there contour rows to fill up with water, break over in the low places and start gullies down the slopes.

On the steeper slopes, all the fields are bench-terraced by the use of stones, sod and other vegetation. Usually the field above each bench-terrace has a different crop from the field below the terrace. One may count 8 to 10 such bench-terraces on many long hillsides. In some localities it is a common practice to pile grass roots, weeds and crop residues on the contour, to form erosion barriers after the field has been plowed. In others, luxuriant growths of cornstalks, weeds and brush are cut down to form a mulch 2 or 3 inches thick.

Typical Ethiopian countryside 100 miles west of Addis Ababa; in foreground, preparations for seeding teff. Rhizomes of sod grasses are stacked in piles to dry and die.

The soil that was here has gone to Egypt. A 12-foot gully on the high plateau 100 miles north of Addis Ababa, in an area where the grass is overstocked and too much land is in cultivation without adequate soil conservation measures.

Then barley is sown. Soon there is a thick luxuriant stand of young plants. On such small fields, even on very steep slopes, there is practically no erosion.

In all Ethiopia there are no drainage-type terraces. This creates a problem, since a large part of the country received 40 to 60 inches of rainfall in a period of approximately 3 months. On probably 10 to 15 percent of the fields, drainage furrows are plowed, usually at intervals of 15 to 20 feet. They are made 6 to 8 inches wide and deep with the wooden plows. Occasionally there is some washing in the bottoms of these furrows but usually one sees clear water drainage from the cultivated fields.

The real key to the preservation of the productivity of the soils of Ethiopia is grass. By far the largest part of the high country is covered with a dense sod or a heavy growth of bunch grass. Volunteer grass enters the rotation of crops as often as every other or every third year. In some of the very high, cool country, where organic matter breaks down very slowly, it is a common practice to pile the sod and burn it in order to raise a crop. It is estimated that 25 to 30 percent of the high plateau and mountainous country is in cultivated crops each year. Often the sod lives through this period of cropping and is ready to grow again as soon as the land is left fallow. Many of the sod grasses are rhizomatous, as well as stoloniferous.

In spite of all these favorable conditions, there is much more erosion than one cares to see. Over 200 miles south of the capital, great hills are completely abandoned on account of excessive erosion. Near the capital, there is considerable gully-erosion. In the northern quarter of the country

Typical zebu cattle on the high plateau 100 miles north of Addis Ababa.

Sacks of grain in the marketplace at Addis Ababa.

A common means of transport in eastern and southern Ethiopia

there is much badly eroded land. Sheet erosion has removed most of the surface soil from the cropland. The grazing land has been so badly used that a large part of it is used only for grazing goats.

In general, erosion conditions are worse on

grazing land than on cropland. As in most other parts of Africa, there are no fences. During the growing season for the crops, each owner is required to keep his cattle on his own land. This is done by herding. The cattle are very carefully watched day and night. Large herds are often bedded on small fields to get the benefit of the manure. After the crops are harvested the stubble fields are open to all comers. Fields may be fallow for several years, but no legumes or grasses are planted to help in restoring organic matter or nitrogen. There are indications that some farmers watch the natural succession of plants and await the appearance of certain indicator plants before they plow the land for crops again. Thus, does shifting cultivation or, in reality, a rotation of crops and sod grasses maintain the productivity of the land through the centuries. But the competition of the herds and flocks for grass causes much land to be severely overgrazed.

Furthermore, cattle are a favored medium for the accumulation of wealth. In the eastern and southern parts of the country, where arid to semiarid conditions exist, the people are almost wholly dependent on their cattle, sheep, goats and camels. In these parts, among some other nomadic people, cattle serve as a medium of exchange in selecting wives. A wealthy man may give his bride's father as many as 100 cows. In keeping with these age-old traditions, cattlemen sell cattle only as it is necessary to secure money for paying taxes, making a trip to the capital or to meet some other of the very few demands they have for cash.

In the high plateau sections, where as much as 50 to 75 percent of the land is in cultivation, a very large part of the cattle being kept are oxen, used for plowing the land. As the crops are raised to serve as human food the oxen are almost wholly dependent on the grazing land adjoining the fields for their maintenance. Consequently, as the percentage of land in cultivation increases the intensity of grazing and subsequent erosion also increases.

On the whole, the relations between population, food requirements, land use, draft animals, methods of cultivation, and the maintenance of soil productivity are very delicately balanced. Any introduction of modern agricultural machinery such as moldboard plows, harrows or tractors would be a dangerous innovation unless adequate provision is made for the application of a complete conservation program.

Upside-down farming with big fields, on a commercial basis, would make such radical changes in soil-water-crop relationships that irreparable damage would be done to the topsoil before the Ethiopian farmers could learn, through their own experience, to cope with such problems. It has happened in the United States, in South America, in other parts of Africa, and it can happen in Ethiopia unless soil conservation is coincident with the modernization of its agriculture.

COUNTY OUTLAWS WOODS FIRES

By L. J. LEFFELMAN

Greene County, Ga., where from one-half to two-thirds of the woodland area of the county was burned over annually prior to 1942, is now adding an estimated $75,000 a year to the value of its timber through voluntary forest fire control.

Although the principal source of income in the county is from its timberland, the only area that had organized fire protection before 1942 was the federally owned land in the North Central Georgia land utilization project under administration of the Soil Conservation Service.

In the spring of 1942, Project Conservationist E. V. Brender, County Agent Francis Bowen, and George F. Powers, at that time work unit conservationist in the Piedmont Soil Conservation District, organized the Greene County Forest Fire Control Program. Every person in the county was given an opportunity to cooperate by giving funds, labor, materials, or time.

Fire pumps, fire rakes, shovels, and axes were furnished by the land utilization project. Two local lumber companies donated lumber for construction of tool boxes, which were built by CCC boys. Nails, hinges, and locks were furnished by the county commissioners, and paint was donated by the board of education.

The Farm Security Administration, vocational teacher, school and county officials assisted in many ways. The county grand jury went on record as supporting the organization and warned that woods burning was permanently outlawed in Greene County. The circuit judge, solicitor, and the sheriff, were especially helpful.

As a result of the program, woods burning has been almost eliminated. Only 14 fires occurred in 1942 and less than 2 percent of the timberland of the county was burned. In 1943, the area was reduced to 1.6 percent and an even better record is in prospect this year.

EDITOR'S NOTE.—The author is chief, regional land management division, Soil Conservation Service, Spartanburg, S. C.

KUDZU CLUB HONORS R. Y. BAILEY

Much has been said and written in recent years concerning the wonder-working new plant of the South, kudzu.

One man, R. Y. Bailey, was largely responsible for lifting kudzu out of obscurity into prominence. He it was, more than anyone else, who discovered its practical potentialities and persuaded farmers to give the plant a trial. He was phenomenally successful in getting kudzu into its proper place in Southern soil conservation. His fervent enthusiasm was infectious, so much so that a bit more than a year ago a unique organization, the Kudzu Club of Georgia, came into being. At the second annual meeting of this club, in November, Dick Bailey was honored with a special citation for "distinguished service to agriculture." The citation, which was presented by Channing Cope, president, read as follows:

THE KUDZU CLUB OF GEORGIA
A CITATION FOR
DISTINGUISHED SERVICE TO AGRICULTURE

The fifty-first birthday anniversary of RICHMOND YOUNG BAILEY occurs upon this fifteenth day of November, nineteen hundred and forty-four, happily coinciding with the date of the second annual meeting of the Kudzu Club of Georgia.

Since RICHMOND YOUNG BAILEY is among the members present at this meeting, the Kudzu Club of Georgia extends to him greetings.

And, in recognition of his many valuable services in the cause of soil conservation, awards him this Citation.

While at the Alabama Experiment Station, RICHMOND YOUNG BAILEY became interested in the possibilities of Kudzu as a means of restoring the most fundamental requirement of human life—the fertility of the soil. He pursued research work and experiments over a period of many years in the face of indifferences, skepticism and ridicule. Later, as Regional Agronomist of the Soil Conservation Service, he has continued his study and active advocacy of Kudzu.

Largely as a result of his pioneering efforts, it has become as established and outstanding hay and forage crop in the Southeast, with 400,000 acres in cultivation.

Future generations in the South, strong, healthy and prosperous by reason of the bountiful returns from their rich earth, will have cause to hold his name in highest esteem.

R. Y. Bailey and Channing Cope.

To RICHMOND YOUNG BAILEY, scientist, agronomist, humanitarian and patriot, the Kudzu Club of Georgia desires to present this token of its esteem and accordingly awards to him this citation of DISTINGUISHED SERVICE TO AGRICULTURE.

By order of the Board of Directors.

Channing Cope, President
Thos. L. Asbury, Secretary

To this citation, Mr. Bailey made the following reply:

"I am glad to have had a small part in helping to bring this valuable crop into its place in southeastern agriculture. Kudzu, if given a reasonable chance, can heal and protect our damaged acres. It can help us use profitably a vast acreage of idle and at present unproductive land. Increased production of grain crops and forage that can result from proper use and treatment of this land will enable us to eat bread from our own fields and meat from our own flocks. Last, but not least, when we use all our land properly we may produce and sell our share of this nation's livestock products."

WOODLANDS FOR MEMORIALS

One-acre woodland memorial areas to honor men and women who have given their lives in the service of their country in the present war will be established throughout the Little River (Ga.) Soil Conservation District.

The plan for establishing the memorial woodland areas was suggested by G. B. Lamkin, of Evans, Ga., one of the district supervisors, and

was unanimously adopted by the district's board of supervisors.

Individual memorials will be established in the home community of the service man or woman. The memorial areas will be located on highways and will be marked with bronze tablets set in Georgia granite.

Title to the woodland areas will be in the Little River Soil Conservation District. Management of the areas will be under supervision of the district supervisors and will be in accordance with sound woodland management practices.

Since the plan was adopted by the supervisors, several offers to give land for the memorials have been made by local people.

The Little River soil conservation district comprises McDuffie and Columbia counties.

REVIEWS

FARMING FOR SECURITY. By William B. Duryee. Published by Whittlesey House, a division of the McGraw-Hill Book Company, Inc. 1943.

Mr. Duryee draws upon his vast experience in teaching and farming and upon that of his many friends in the State of New Jersey to set forth a design for living in the country. He recognizes the advantages of such a living, while pointing out the pitfalls and setting up signposts for the guidance of those planning a life on and from the land.

The author attempts to avoid the too-rosy picture of farming painted by an enthusiast, as well as the dour viewpoint of the man who predicts disaster for anyone attempting to return to the land. He attempts, rather, to present a true picture for those who want to know the facts.

The book points out clearly the great need for a true love for the land, and for things growing upon it, if any farming venture is to be a success. It also urges strongly the need for sufficient capital in the form of savings or an income to meet obligations while getting established.

Food, shelter, and clothing are the three basic needs of mankind. The author shows how a place in the country can provide the first two and the resources for acquiring the third. The book makes clear that successful country living is definitely a way of life, not a hard-hearted, half-apologetic imitation of city ways.

The philosophy of security is tightly woven throughout. The first chapter, "Security in Today's World," has much to show the advantages of country living in meeting this fundamental need of every family. The raising of most of the family's food, the more practical type of clothing worn in the country, the many ways of meeting higher income taxes and future economic depressions are all advantages clearly shown by successful country living.

Very good advice is given in the second chapter on the kind of farm to buy. Mr. Duryee makes the sound point that the farm should meet one's requirements, which vary widely with the individual, and that such a farm should wear well. He emphasizes the importance, in buying a farm, of having certain specifications in mind and not permitting oneself to be "sold" by one's own impulse or the high-pressure methods occasionally employed by people having poor property to sell. Mr. Duryee enumerates some important items to consider bearing on the type, number and condition of buildings, the farm site; the type of soil and extent of erosion; field management for conservation farming, and the great importance of building and maintaining high soil fertility. Here are some truly valuable suggestions for successful farming for either experienced or non-experienced men.

In looking about for a place to establish a home in the country, the importance of choosing a good farming areas is shown. The type of farming desired should be in harmony with soils, climate and available markets. In view of the fact that one does not move to a farm for the purpose of withdrawing from the world or to become less interested in what is going on, advice is given to look closely to the type of community in which the prospective farm is located. Emphasized is the importance of a progressive minded community, modern schools, churches, and desirable social activities.

Mr. Duryee devotes an entire chapter to the importance of good soil and its value in making for success or failure of a farming enterprise. He endeavors to point out some of the fundamentals to give a better understanding of soil types, how they originate, their weak points and their strong points. He also shows the importance of proper land use and past methods of management upon the present fertility of the soil.

Some very sound advice is given on the question of the price a person should pay. Here, again, variations are factors, much depends on size of farm desired, soil, location, buildings, and personal desires of the individual buyer. However, for successful long-time farming the average cost per acre of about $100 is given as a sound figure if it is to be repaid from the land itself.

An attempt is made by Mr. Duryee to answer the very good question of "What shall we use for money?" He discusses the different systems of loaning money on farming from banks to the various government agencies. He emphasizes the disadvantages of high interest rates, particularly the type paid if one has to buy machinery, fertilizers, seed or other farming needs on time. Sound personal advice naturally can't be given in such a short chapter but various sources of such detailed information are given.

Considerable fundamental information is given on poultry raising, livestock production, increasing income from bees, food from home gardens, producing milk enough for family needs, fruit and berry production, as well as on marketing farm products. A very worthwhile chapter is devoted to ornamenting the country home for more pleasant living.

The reading of the book by any urban family that has a desire for country living is highly recommended. Naturally it does not answer all of an individual's questions but most of the "do's" and "don'ts" are presented in such an interesting way as to strongly stimulate one's interest in finding further detailed information on "Farming for Security."

—GROVER F. BROWN.

REFERENCE LIST ☆☆

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SOIL CONSERVATION SERVICE

Devices for Measuring Rates and Amounts of Runoff Employed in Soil Conservation Research. SCS-TP-51. Compiled for Latin American Trainees—not available for general distribution. July 1943, revised October 1944. Processed.

Health and Vigor: Competition and Production. Regional Bulletin No. 97, Range Management Series No. 9. Regional Office, Soil Conservation Service, Albuquerque, N. Mex. November 1944.

Practical Results of Ten Years of Range Conservation and Erosion Control in Northwestern New Mexico. Regional Bulletin No. 96, Evaluation Series No. 4. Regional Office, Soil Conservation Service, Albuquerque, N. Mex. October 1944.

Report on Tests Made on Three Types of Flume Entrance. Soil Conservation Service, with the cooperation of the Minnesota Agricultural Experiment Station, St. Anthony Falls Hydraulic Laboratory, Minneapolis. August 1944.

OFFICE OF INFORMATION U. S. DEPARTMENT OF AGRICULTURE

Decay of Logging Slash in the Northeast. Technical Bulletin No. 876. Bureau of Plant Industry, Soils, and Agricultural Engineering, Agricultural Research Administration. September 1944. 10c. [1]

Drought in the United States Analyzed by Means of the Theory of Probability. Technical Bulletin No. 819. Soil Conservation Service. Printed April 1942 (Released for distribution October 1944).

Farm Production, Farm Disposition, and Value of Buckwheat, 1909-41. Bureau of Agricultural Economics. October 1944. Processed.

Patent Manual for Employees of the United States Department of Agriculture. Miscellaneous Publication No. 551. A cooperative publication by the Office of the Solicitor and the Research Agencies of the Department of Agriculture. 1944.

Physical Land Conditions in the Western and Southeastern Baca County Soil Conservation Districts, Colorado. Physical Land Survey No. 30. Soil Conservation Service. 1944.

Prevention and Control of Gullies. Farmers' Bulletin No. 1813. Soil Conservation Service. Reprinted September 1944.

Sorghum Diseases and Their Control. Farmers' Bulletin No. 1959. Bureau of Plant Industry, Soils, and Agricultural Engineering, Agricultural Research Administration. October 1944. 10c. [1]

STATE BULLETINS

Agricultural Economic News for Michigan. No. 32. Agricultural Extension Service, Michigan State College, East Lansing, Mich. July 1944.

Clovers for Greater Production in Western Washington. Circular No. 83. Agricultural Extension Service, State College of Washington, Pullman, Wash. June 1944.

Colorado Farm Bulletin. Volume VI, Number 5. Bimonthly Publication of the Agricultural Experiment Station, Colorado A. & M. College, Fort Collins, Colo. September-October 1944.

Comparison of Mixed Fertilizers Produced from Various Nitrogen and Phosphoric Acid Sources. Bulletin No. 450. Agricultural Experiment Station, University of Arkansas, Fayetteville, Ark. June 1944.

Current Farm Economics in Oklahoma. Vol. 17, No. 5. Agricultural Experiment Station, Oklahoma A. & M. College, Stillwater, Okla. October 1944.

Effect of the Use of Winter Legumes on Yields of Cotton, Corn, and Rice. Bulletin No. 451. Agricultural Experiment Station, University of Arkansas, Fayetteville, Ark. June 1944.

An Efficient, Labor-Saving Method of Steaming Soil. Bulletin No. 635. Agricultural Extension Service, Cornell University, Ithaca, New York. January 1944.

Forest Trees and Shrubs: What, Where, and How to Plant. Bulletin No. 264. Agricultural Extension Service, Michigan State College, East Lansing, Mich. October 1944.

Greater Production through Research. Bulletin No. 443. Fifty-Fifth Annual Report of the Agricultural Experiment Station, University of Arkansas, Fayetteville, Ark. June 1944.

Growth Status of the Cotton Plant as Influenced by the Supply of Nitrogen. Bulletin No. 446. Agricultural Experiment Station, University of Arkansas, Fayetteville, Ark. June 1944.

Improvement of Flood-Damaged Land in Eastern Oklahoma. Bulletin No. 282, Agricultural Experiment Station, Oklahoma A. & M. College, Stillwater, Okla. October 1944.

Losing Farms by the Truckload. Pamphlet No. 1 State Soil Conservation Committee, Blacksburg, Virginia. August 1944.

Maintenance of Alfalfa Stands. Bulletin No. 447. Agricultural Experiment Station, University of Arkansas, Fayetteville, Ark. June 1944.

Peanut Production Experiments, 1931-41. Bulletin No. 448. Agricultural Experiment Station, University of Arkansas, Fayetteville, Ark. June 1944.

Renovation of Established Pastures. Circular No. 74. Agricultural Extension Service, State College of Washington, Pullman, Wash. June 1944.

Results of Experiments with Rice in Louisiana. Bulletin No. 384. Agricultural Experiment Stations, Louisiana State University and Agricultural and Mechanical College, Baton Rouge, La. August 1944.

Rotation, Cultural, and Irrigation Practices Affecting Rice Production. Bulletin No. 445. Agricultural Experiment Station, University of Arkansas, Fayetteville, Ark. June 1944.

Science for the Farmer. Bulletin No. 464. 57th Annual Report of the Agricultural Experiment Station, Pennsylvania State College, State College, Pa. July 1944.

Seed Treatment with Plant Hormones in Crop Production. Bulletin No. 444. Agricultural Experiment Station, University of Arkansas, Fayetteville, Ark. June 1944.

Selected Social Factors Affecting Participation of Farmers in Agricultural Extension Work. Special Bulletin No. 331. Agricultural Experiment Station, Michigan State College, East Lansing, Mich. June 1944.

Soil Reaction (pH): Some Critical Factors in Its Determination, Control and Significance. Technical Bulletin No. 400. Agricultural Experiment Station, University of Florida, Gainesville, Fla. August 1944.

Soybean Trials in Wyoming. Bulletin No. 267. Agricultural Experiment Station, University of Wyoming, Laramie, Wyo. August 1944.

A Survey of the Land Cover of Oconto County, Wisconsin: Land Cover Maps. State Department of Agriculture, Land Use Section, Madison, Wis. 1944.

Tensile Strength of Yucca Fibers. Technical Bulletin No. 316. Agricultural Experiment Station, New Mexico College of Agriculture and Mechanic Arts, State College, N. Mex. August 1944.

[1] From Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.

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SOIL CONSERVATION

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SOIL CONSERVATION

CLAUDE R. WICKARD · MARVIN JONES · HUGH H. BENNETT
SECRETARY OF AGRICULTURE · WAR FOOD ADMINISTRATOR · CHIEF, SOIL CONSERVATION SERVICE

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WELLINGTON BRINK EDITOR

CONTENTS

Front Cover: Returning from the Seven Lakes Snow Course with sampling equipment and notebooks crammed with data that mean dollars and cents to agriculturists and power companies in the valleys far below. Photographer: Jack G. James.

SOIL CONSERVATION *is issued monthly by* SOIL CONSERVATION SERVICE of the United States Department of Agriculture, Washington, D. C. The matter contained herein is published by direction of the Secretary of Agriculture as administrative information required for proper transaction of the public business, with the approval of the Director of the Budget. SOIL CONSERVATION seeks to supply to workers of the Department of Agriculture engaged in soil conservation activities, information of special help to them in the performance of their duties. Copies may be obtained from the Superintendent of Documents, Government Printing Office, Washington 25, D. C., 10 cents a copy, or by subscription at the rate of $1.00 per year, domestic; $1.50 per year, foreign. Postage stamps, will not be accepted in payment.

The Tall Grass is Coming Back

Cows grazing on crested wheatgrass pasture of Earl Bays. These animals have ample green forage between time cheat grass matures and mountain pastures are ready.

By EARL R. BAYS

Old-timers tell me that, back in the early days, the Glade Park country was a land of tall grass. In fact, before it was named Glade Park it was known as "the big grass country." Today, the grass has disappeared and has been replaced by sagebrush, which offers little or no food for cattle except in winter, and even then the use of supplemental concentrates is necessary. Apparently grass has gone from this area as a result of homesteading and too heavy summer use. The first use of this land was by the "S-Cross" and Seibert cattle companies, who drifted to the summer range of Pinion Mesa at an elevation of 8,500 to 10,000 feet, and came back for winter grazing in the Glade Park area.

Charles V. Eckman and I came from north-central Kansas after the first World War, in 1921, and took up a homestead on the west end of Glade Park. At that time there were 12 or more families living in this community, and our West End School had an enrollment of 23 pupils. Farming, with some livestock operation, was practiced by most of the settlers. Sage hens were quite plentiful and remained so until the season opened a few years ago.

Then the dry years came, and some of the families started to "pull up stakes" and leave the country. The area certainly has changed in the 20-odd years since I came here. The sage hens have practically disappeared, the tall grass is gone on most of the area, and of the 12 families here in the West End, only four are left.

After the First World War, a grateful government passed out dryland homesteads to returning veterans. For a few years, during a favorable weather cycle, many of these homesteaders made good crops, for the virgin soil had been storing up fertility through the centuries. Then came drought, dust, and depression. Personal tragedies that grew out of this last hopeful wave of pioneering are familiar to all Westerners. However, not all of these farmers were downed by failure. This is the story of Earl R. Bays of Mesa County, Colorado, one of the veterans who "stuck it out" and made a success because he learned to work with nature, not against her. In his own words, he tells how the plow and heavy grazing ruined a "tall grass country," and how tall grass is coming back again.

Several years ago I could see that cash cropping was not the thing for the Glade Park area. I had a few head of livestock and tried to raise winter feed by farming. Occasionally we would hit a good crop year, but several years it has cost me $40 a ton to raise the feed. You can't make money that way, so about the time I was figuring out a new way of farming, the Soil Conservation Service came along.

We organized a Soil Conservation District up here in 1940, and with the help and advice of technicians assigned to the district, I put in 50 acres of crested wheat grass. I planted it in the fall, and the next spring I was quite disappointed with the small showing. The next year the stand was better, and the third year a favorable growing season brought it really into its own. I cut a hay crop of a ton and a half to the acre, besides getting a good fall pasture.

Before cutting the hay crop, representatives of the Soil Conservation Service and I took a test of three plots. Plot No. 1, consisting of crested wheatgrass, brome, and some volunteer rye, was in a low swale or draw that flooded. It was not a fair test, but we wanted to see what could be expected under the most favorable conditions. Plot No. 2, consisting of straight crested wheat, was a little lighter in stand but over 3 feet high. Plot No. 3, also straight crested wheat ran heavier but not so tall. The following summary shows the green weight, the percentage of shrinkage, and the final weight of thoroughly dried hay per acre.

Plot	Green weight	Percent shrinkage	Dry weight
1	12,380	63	4,687
2	8,476	58.5	3,500
3	6,250	57	2,687

Considerable area, especially in the sagebrush country, has cheat or June grass as its principal forage. Since there is a gap between the time cheat grass is available and the time that summer pasture is ready for use in the higher country, the stock usually lost a little ground. Crested wheat grass seemed to be the most practical feed to fill this gap.

Shortly after revising my farming operations I bought another 400 acres that had about 70 acres of cleared land, and put that into crested wheat. It was so satisfactory that I purchased another 800 acres, 300 of which are broken. The former owner had been farming quite extensively, with varied success. At the time I started my grass farming, several other dryland farmers rather scoffed at the idea of using cleared land to grow grass. At present, some of those farmers are gone, and my cows are running on grass I planted on lands they previously farmed.

I drilled in crested wheat on this entire acreage of cleared land. Under favorable conditions, it will be a great help in spring and winter feeding. Last spring, I took off 200 acres or more of sagebrush which was seeded last fall to a mixture of crested wheat, Western wheat, sand dropseed, and side-oats grama.

Crested wheat seems to be the most satisfactory grass for this semi-arid area, because it has the peculiar ability to go dormant in a drouth and simply wait for rain to come. The reports from various experiment stations over several states indicate that after crested wheat has survived the first eight months, there is no record of a field being lost from drouth, or pests.

Crested wheat will furnish excellent fall pasture provided there is sufficient moisture in the late summer and early fall. Staying green under the snow all winter, it provided one of the earliest spring feeds available.

Wind erosion on cultivated land has been quite bad at times. The grass has stopped this erosion, the washes below the fields are starting to heal over, and in time will fill up.

My experience with crested wheatgrass has been entirely satisfactory. If fields of this grass are not pastured in the spring, the growth should be at least knee-high and, at times, three feet high, with a good seed crop—depending, of course, on the moisture.

The crested wheat pastures prevent livestock from losing weight during the period between maturity of cheat grass and availability of mountain pasture. I find that "booming" cows and calves during this period, instead of letting them fall behind, makes a wonderful difference in the fall, both in the weight of calves and in the flesh the cows are carrying to go into the winter season. April and May calves so pastured will weigh 425 pounds or better by the first of November. That is a good weight for spring calves in any man's country.

The Soil Conservation Service technicians inform me that approximately 4,400 acres of former dry farming land in this area have been seeded to crested wheatgrass. It is my opinion that crested wheatgrass is here to stay in the Glade Park country.

KUDZU MOVES NORTH

The SCS nursery at Beltsville, Md., will plant several acres of kudzu to provide crowns for trial north of Mason and Dixon's line.

Sagebrush land was brought into production here by relocating the irrigation laterals. A good crop of hay is now produced, as an addition to the bed base of a large livestock ranch. Part of the original meadow has become infested with willows. It will have to be cleared and seeded to an improved grass-legume mixture.

IRRIGATED MOUNTAIN MEADOWS

By WILKIE COLLINS, JR.

Last year a Wyoming rancher harvested the hay from a demonstrational seeding of tame grasses and legumes on some of the poorest of his irrigated land.

The results gave him food for thought. The tame grass mixture yielded twice as much per acre as his native irrigated meadows on better land. This happened even though the seeded area had been irrigated less, and had been very heavily grazed by the cattle before they were moved to the range about June 1.

Now this rancher, C. C. Feltner, near Pinedale, has begun the establishment of tame grass mixtures on his meadow lands. And equally important, he is changing his irrigation practices with help from the Pinedale Soil Conservation District and Soil Conservation Service technicians. His goal: More and better feed supplies and better pasture for his livestock when they are not on the range.

There are thousands like Mr. Feltner in the Northern Great Plains, ranchers who depend on irrigation for hay crops but have seen hay yields fall off and water requirements rise. Constant irrigation from spring until shortly before haying time has forced out the higher yielding grasses and encouraged the invasion of coarse grasses, sedges and rushes. Failure to use fertilizer has also contributed to the decline.

EDITOR'S NOTE.—The author is chief, regional agronomy division, Soil Conservation Service, Lincoln, Neb.

It is among these people that nearly all accomplishments in improving irrigated pastures and meadows have been attained in this region. Comparative production of the same sort of crop is easy to understand. In the intensively farmed areas, on the other hand, grass for irrigated pasture or hay production comes into direct land-use competition with specialty crops such as sugar beets and beans. Nevertheless, assistance in improving and establishing irrigated meadows and pastures is one of the big jobs in the Northern Great Plains.

The job in the livestock ranch country is fourfold: Introduction of grasses and legumes that will produce more hay tonnage per acre and more pasture; mechanical improvements in the irrigation system so that the ranchers can control and measure the irrigation water applied; introduction of better irrigation practices to replace the custom of constant irrigation from spring until shortly before haying time; and development of management plans. What is done on one square mile of such hayland affects the welfare of establishments aggregating many times that acreage, through improving the feed base.

Plants growing in those long over-irrigated meadows are those which require excessive amounts of water. While yields of one-half or three-quarters of a ton of hay per acre are more nearly the rule than the exception, any reduction in the amounts of water applied will reduce the yields

still further. Therefore, renovation must be "grown from the ground up." That is, plowing up the old grasses and seeding new mixtures.

The practice is to plow up an old meadow and seed it to small grain, usually oats, for a couple of years in order to clean up the land. Leveling is done where necessary and practical, and manure, which heretofore has been largely wasted on the livestock ranches, is applied. Then mixtures of adapted grasses and legumes, which produce a high-protein feed, are seeded.

To date, local preference rather than proved superiority over other mixtures governs selections. A bromegrass-alfalfa mixture is more generally approved where it is adapted, because it appears to be a good yielder and very palatable to livestock both as hay and pasture. Mammoth red, alsike, white dutch and strawberry clovers are frequently used, while among the grasses are found tall oat-grass, meadow fescue, orchard grass, slender wheatgrass, perennial rye grass, crested wheat-grass timothy, redtop, and scotchgrass.

Joe Budd, Big Piney, Wyo. operating an old, widely known ranch which his father established, is one of the ranchers well along with the renovation of his irrigated meadows. His experiences cover rather well the whole problem of renovation —the benefits of controlling and measuring water, better grasses and legumes and the need for a job done from-the-ground-up. Formerly short of water as a usual thing, Budd figures now on bringing about 25 percent more land under irrigation as a result of water savings.

Whereas the usual yield of native irrigated meadows ranged from a half-ton to a ton per acre in 1944, which was pretty good, he reported that his improved meadows produced 1½ to 2 tons per acre, depending on the quality of the soil. In contrast to the flooding system generally used, Budd's improved meadows are irrigated systematically, water turned on for 3 days, then off for 5. Irrigation water is controlled and measured by turnout boxes, and laterals are located so as to get quick, even distribution of the water.

"I have found, too, that one just throws his money away when he tries to seed the improved mixtures in native irrigated meadows," Budd remarked. "I tried it. Those native grasses take a lot of water to produce hay. The tame grasses and legumes can't stand that much, so they just won't grow."

He went on to explain that he still has some native meadow that he hasn't renovated yet. This gives him a direct comparison of how the native grass meadow took much more water, but produced less hay.

A development of another sort is the Reed Dayton ranch, only 4 miles from Cokeville, Wyo., where leveling of the land is not practical. Instead, water has to be led to the higher places and distributed carefully so as to avoid ponding in the lower areas. The Soil Conservation Service technicians designed an irrigation system that places the water at the right places. It is carried across the low places on levees.

This 640-acre ranch, of which some 40 or 50 acres is still unirrigated and covered with sage-brush, is producing some wheat as a cash crop, as well as pasture and feed for 50 dairy cows. A good part of the ranch has already been seeded to a mixture of alfalfa, sweet clover, bromegrass and crested wheatgrass. One oat field was also seeded to the grass mixture along with the crop last spring.

On the basis of his experience with the irrigated grass and legume mixture for pasture and hay production, Dayton is contemplating converting to a 150- to 200-head beef outfit, when he gets through developing his irrigation system and grass seeding program. His pasture experience indicates that he has set his sights conservatively.

If he does convert, he will be maintaining a livestock enterprise which ordinarily in that area would be thought of as requiring native range and native grass irrigated meadow totaling 3,500 to 4,000 acres.

In the same way, the livestock growers are learning the superiority of grass-legume mixtures for pasture. It is customary for the ranchers to graze their hay meadows in fall after the stock is brought in from the range, and those who have had experience report their cattle maintain their flesh in fine shape on such pasture.

Howard Bleick, 18 miles west of Thompsen Falls, Montana, has found that putting his milk cows on an irrigated mixture of bromegrass, clover and meadow fescue resulted in 25 percent more cream production. This grazing is at a considerably higher rate than his native irrigated pasture can stand. He has found, too, that it pays to keep cattle off a pasture during the time it is being irrigated, because trampling of grass while the ground is wet causes too much damage to the plants. He's planning on more grass-legume pasture.

Tests at the Wyoming experiment farm are comparing the results of grain feeding yearling steers on irrigated pastures and lot feeding. Four

recommended mixtures are used in the irrigated grass plots. The results thus far indicate that under average conditions the net income from grain feeding in irrigated pasture compares favorably with the income from intensively cultivated crops. This is true with most grass-legume mixtures under proper irrigation and management.

Farmers and ranchers frequently ask, "What is the value of an irrigated pasture?" They want to know how the income from an irrigated pasture compares with the income from other irrigated crops. This question is hard to answer as adequate information on the economical value of irrigated pastures is not available. Naturally, the value of an irrigated pasture varies with the productivity of the soil, the kind of pasture, the way it is irrigated and managed, and the price of beef, butterfat and wool, and the quality of livestock grazed. There are examples of farmers who keep records and evaluate good irrigated pastures at from $25 to $75 per acre annually. One feeder in western Nebraska estimates $76 an acre as the value of his irrigated pastures for one year. Another gives $55 as the value of his pasture. One of the experiment stations has produced 16 cow months of grazing per acre from a good irrigated pasture.

Tom Coleman, one of the district supervisors of the Popo Agie Soil Conservation District at Lander, Wyo., cuts 2 tons of high quality hay per acre and then subjects his irrigated pasture to grazing. From this is returned $35 worth of butterfat per acre. With hay worth $10 a ton, a value is realized of approximately $55 per acre from the irrigated grass-legume mixture used in combination for hay and pasture. Results have been so satisfactory that Mr. Coleman is seeding all of his irrigated land to grass-legume mixture for hay and grazing purposes.

In a recent trip through Wyoming, seven of the soil conservation districts located in irrigated areas were visited and several district supervisors, farmers, ranchers, county agents, and Soil Conservation Service technicians were asked as to the value of irrigated pastures. Their general opinion was that the economic returns from an adapted and well managed irrigated pasture is equivalent to or greater than the returns from other crops produced under irrigation on similar soil types.

Farmers are recognizing more and more the necessity of livestock manures in maintaining the fertility of irrigated land. With livestock so es-

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Much of this irrigated meadow was covered with willows. It was cleared, planted first to small grain for a couple of years, then to tame grass and legumes for hay production and pasture. Technicians of the Soil Conservation Service designed the irrigation system so that distribution of water can be controlled. It provides hay and pasture for a dairy farm.

Take Care of the Range and the Profits Take Care of Themselves

By W. T. WHITE

John Wright in the Pahranagat Valley Soil Conservation District in southeastern Nevada has been helped by soil conservation practices to build up a thriving cattle feeding business in addition to running his own herd.

Conservation practices bid fair to play a progressively important role on a third of a billion acres of privately owned range land in five states of the Pacific northwest.

Indicative of the role open to improved range land-use and management practices is the increased war-time beef production from soil conserving practices. A survey reports a 41 percent increase from such practices on farms of the region. Any post-war let-up in demands for meat and wool will in no wise lessen the importance of good range pasture and its proper conservation use for efficient and economical operation.

Forage types vary from the perennial bunchgrasses of the Pacific Northwest (Idaho, Oregon and Washington), such as beardless and bluebunch wheatgrass, Idaho fescue and big bluegrass, to the California annuals like Alfilaria, bur clover and annual bromes such as soft ches. Such perennials as California oatgrass and purple needlegrass also are found in California, just as is the annual, cheatgrass, which supplies forage on many northwestern ranges. Desert-type grasses and even some of the prairie grasses, like the gramas, predominate in Nevada.

Seasons of use also differ somewhat within the Pacific Coast region: Whereas the conventional spring, summer and fall grazing with winter feeding prevails in the eastern Washington and Oregon and southern Idaho range areas, so-called winter grazing is common in the California areas of annual vegetation. Late fall and mid-winter rains,

EDITOR'S NOTE. — The author is regional chief of the range division, Soil Conservation Service, Pacific Coast Region 7, Portland, Ore.

in other words, bring on annual grass growth, and the stock may be turned on it after the first of the year. Then the first hot summer weather dries up the annual forage, necessitating movement to mountain summer range where that is available, or to supplemental pasture and feed. Thus, fall

Pacific Coast ranchers like their stockwater ponds. This one is on the Charles Petrie ranch in the Upper Thomas Creek erosion control demonstration project west of Corning, Cal.

pasturing of stubble and other aftermath also becomes popular. Nevada, though primarily in the regular spring-summer-fall grazing belt, also has considerable "winter grazing," on the desert ranges.

Regardless of these intra-regional differences in forage types and seasons of use, the special problems posed by some of them actually serve only to emphasize the basic place in the range conservation program of so-called standard practices: Stocking within carrying capacity; deferred and rotation grazing; stockwater development, salting and other devices to assure even distribution; growing supplemental feed and keeping the proper balance between range forage and such supplemental feed supplies. Local conditions dictate the emphasis.

It is agreed that range forage and good pasturage provide the cheapest livestock gains. Consequently, as profits depend to a large extent upon the kind and quality of feed provided, range conservation means cheaper gains on range livestock. Our depleted ranges have broken down under excessive and uncontrolled grazing use and accordingly are less productive than they once were. Fortunately, most of the injured ranges in the Pacific Coast states still retain enough of the best forage plants to permit them to be built back to better and sustained production. This is contingent on the adoption of an extensive improvement program. Through soil conservation districts, especially, many of them, including some of the largest cattle and sheep operators in the country, already are doing this very thing.

All our range today is limited or fenced, and operators must depend upon a continued high yield from their allotted or fenced areas, whether leased or owned. The major objective, then, is currently to harvest by grazing only that portion of the important forage plants which will allow the desired plants to maintain full vigor for maximum yield and effectively compete with the less desirable plants. Accurate practical knowledge of the effects of grazing upon the important forage plants thus becomes the key to sound management. And the operator cannot apply sound management if, because of a lack of feed or spring pasture, let us say, he is forced onto the range too early in the season, before the key plants attain sufficient growth to produce normal root and top growth and become able to withstand grazing without serious loss of vigor.

Similarly, when too large a proportion of the season's growth is removed by grazing, the desirable plants fail to mature seed, and insufficient residues are left to protect the soil and plant roots from the injurious effects of low temperatures and beating rain. In the western states, characterized by wet winters and dry summers, severe seasonal overgrazing may be expected to subject the range to excessive run-off, low moisture absorption by the soil, soil washing, soil blowing, exposure of roots and crowns of forage plants to frost injury and dessication, resulting in delayed starting or retarded growth of the next season's forage crop.

Representative of the range conservation practices that Pacific Coast ranchers have found to be profitable are these:

1. Deferred spring use to allow key forage plants to attain full vigor and mature seed.
2. Shifting from sheep to cattle or from cattle to sheep for a time, or arranging to graze sheep and cattle in alternate years.
3. Grazing no more than the proper proportion of the best forage plants.
4. Leaving some plant residues each year to accumulate and to protect the topsoil.
5. Delaying "turnout" of stock on the range in the spring until the soil has become firm.
6. Reducing excessive travel and trailing by fencing, and locating water supplies and salt stations so as to cut down travel.
7. Using movable salt stations to encourage stock to go into under-utilized areas of the range and, by the same token, removing salt from areas already properly grazed or over grazed.
8. Marketing sale stock promptly before they begin to shrink.
9. Culling inferior animals rigidly, leaving the good, thrifty animals that produce more gains on the same feed than do unthrifty, inferior stock.

Many other measures are also in effect, including plant control, contour furrowing and water spreading, planting temporary pastures, and fire protection. Certain local conditions also lead to developing Harding grass and burnet for dryland pasture to supplement California's annual forage, and to encouraging improved irrigated pastures and haylands on headquarters ranches in Nevada, where most of the range proper is public domain. Growing of more winter feed is the main need on private lands in districts and elsewhere.

Whatever the specific practices, the objective is to keep the optimum amount of forage cover on the range, both as the most profitable continuing crop and to protect the soil against erosion and conserve the moisture for plant growth. For the perennial grasses, the aim in the Pacific Coast states

is to keep stock off in the spring until the new growth is 4 to 6 inches tall and, similarly, to leave at least 4 inches of growth to go through the winter. For the California annual-type vegetation, the general recommendation is to leave not less than 400 to 500 pounds of dry material.

Though herd or flock adjustment to fit such a pattern of forage conservation and available feed supplies sometimes comes hard, the experiences of progressive stockmen are directing attention to the fact that it is the amount of meat and wool that goes to market, and the money in the bank, that measure their success, not the numbers of cattle or sheep on the ranges. Steve Adams, big operator south of Lava Hot Springs, Idaho, found as a result of his range management plan developed through the Portneuf Soil Conservation District that one band of sheep was more profitable than two bands of the same size which had been grazed on the same range.

Examples are multiple that range conservation pays. In the Escondido Soil Conservation District in San Diego County, Cal., to pick at random, the district's pasture and permanent hay programs alone were credited with adding 100,000 pounds of beef to the war stockpiles the last fiscal year. District Director George E. Satterlee attributed half of the valley's 5-fold increase in cattle since the war to the war demands and "the other 50 percent to our pasture and conservation program."

In eastern Nevada's big White Pine Soil Conservation District—the biggest anywhere—the all-important livestock business depends largely upon public range supplemented by winter feed, with efficient use of irrigation water vital to its production. District Treasurer George N. Swallow, big local operator, said that district facilities had "enabled cooperators to increase production from 30 to 60 percent, and at the same time cut materially the unit cost of production." John Wright in the Pahranagat Valley district in the same state now feeds out approximately 150 steers each winter and has 270 Herefords in his own herd; before the war he fed none. Drainage and leveling of part of his feed-producing land, with the aid of district facilities, helped him accomplish this.

Back in California, in the Elkhorn Soil Conservation District, Tony Garcia increased the carrying capacity of his range from approximately one animal unit month to almost four, by proper stocking, fertilization and supplemental feeding on poor parts of his pasture.

Sweetclover pasture, seeded in conservation rotations, and pea stubble in the North Palouse

Sheepman Jimmy Richardson went in for fenced pastures to aid conservation management of his range, and to assist in herding and coyote control on the 20,000-acre McKenzie-Richardson ranch near LaCrosse, Wash. Here is seen a section of one 10-mile stretch of the 100 miles of fence being built.

(Washington) Soil Conservation District have been a boon to enterprising stockmen from nearby areas. In 1943, one outside sheep man alone took off 2,500 animal-unit months of sweetclover pasture, and more than 6,200 animal-unit months from 11,305 acres of pea stubble.

Returns to ranchers using the half-dozen land utilization project ranges in the Pacific Coast region during the past fiscal year tell a convincing story of the contribution to the war effort and profit for the operators arising from conservative range management. These projects total 360,116 acres in the region. On them, 505,480 pounds of beef, with a cash value of $75,922 were produced. Cost of management—including developments for future returns, such as seeding, fencing and stockwater improvements—ranged from 2-1/10 cents an acre to a high of 23 cents in one instance, with the next high 8-1/2 cents. Thus a 3-2/10-cent management cost on the 220,000-acre southeastern Idaho project returned war meat valued at $33,100. Improvement in the quality of permittees' herds was another result of the program.

In the central Oregon project, one lot of mixed-age steers gained more than 2-1/2 pounds a day for 63 days on a land utilization range consisting mostly of crested wheatgrass, which permittees in this area are seeding widely on their own lands. Chiefly because of improvement in project ranges, 11 percent more cattle were permitted on them in the spring of 1944 than in the same season of 1943.

Although range reseeding largely is limited in this region to special situations where it unquestionably is economically justifiable, considerable success has attended seeding abandoned cropland back to range grass, both within and outside of land utilization holdings. Thus Milt Branch in the Weiser River, Idaho, Soil Conservation District

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Irrigated Pastures Spurred by War

By HAROLD E. TOWER and FRANK B. HARPER

This good irrigated pasture is on the Joe Buerkili farm in Lewis County, near Chehalis, Wash. It uses a sprinkler system to supply water needed in this coastal area of high rainfall during the dry summer months.

War demand for meat and butter has brought improved pasture into its own as a desirable and profitable crop for irrigation farmers of the Pacific Coast region.

Butterfat produced at 8 cents a pound for feed cost on pasture instead of at 20 cents to cover hay and other feed outlays (as found by the Idaho State Extension Service), represents a sound investment of time, seed and land. One car of butter is the equivalent of 40 cars of hay, yet can be shipped at only 4½ percent the cost.

Furthermore, improved irrigated pastures stand high on the list of conservation land-use objectives in at least two-thirds of this westernmost region's approximately four score soil conservation districts. They are wanted from the dairy farms of western Washington, Oregon and California to the high mountain livestock ranches of eastern Nevada and Idaho. That is because well managed pastures provide at low cost high quality feed rich in essential vitamins and minerals, because good pasture sods are unexcelled in controlling erosion of sloping lands, because pasture grasses and legumes are adapted to soils that are too shallow, too wet or too alkaline for most cultivated crops, and because pasture sod is an ideal soil-improving rotation crop.

EDITOR'S NOTE.—The authors are regional chief of the agronomy division and head of the current information section, division of information, Soil Conservation Service, Portland, Ore.

Even in the coastal belts of Oregon and Washington, where rainfall averages 35 to 80 inches a year, and even more in some places, supplemental irrigation of pasture has proved its worth. More and more farmers are installing sprinkler irrigation systems. Five such systems were put in by South Tillamook Soil Conservation District dairy farmers, in Oregon, during 1944.

This seeming paradox is explained by the fact that summer rainfall is low west of the Cascade Mountains, where pasture production is abundant until June and then drops rapidly. Supplemental irrigation in June, July and August keeps the pastures growing and succulent during this critical period. Total yields are increased. Summer feeding costs are reduced. Management is simplified.

At the Western Washington Experiment Station, supplemental irrigation of ryegrass pastures was found to increase production 42 percent. The Oregon Experiment Station learned that the cost of an animal unit day of grazing on irrigated ladino pasture was 6.3 cents as compared with 7.8½ cents on summer Sudan grass pasture. Sam DeYoung in one year increased butterfat production from 390 pounds to 442 pounds per cow in one year by fertilizers, managed grazing and sprinkler irrigation. He is in the Montesano—Elma—Oakville Soils Conservation District, western Washington, where annual rainfall is between 90 and 100 inches.

In the interior irrigated valleys where diversified farming predominates, irrigated pastures long have been important in land use. In other areas of more specialized cropping, such pastures have occupied only a minor place. But war food demands have brought about some gratifying changes. When a magnesium plant was established at Las Vegas, Nev., for example, an immediately increased demand for dairy products arose. Farmers in the Moapa Valley Soil Conservation District, near Overton, are close to this market. They are increasing their production, among other ways, through development and improvement of irrigated pastures.

John Lewis is one of those who pioneered this program. He established a good irrigated grass-legume pasture in the fall of 1943. As he did not have enough of this pasture, however, for all the needs of his 40-cow dairy herd, Lewis rotated his 1944 grazing between the grass-legume pasture and annual winter barley planted likewise for pasture. He reported that when his cows were on the grass-legume pasture, the herd's milk output went up about 10 gallons a day as compared with production when on the barley pasture.

A seeded irrigated pasture on the I. W. Brunk farm in the Upper Thomes Creek Demonstration Project near Corning, Calif., brought milk production up 50 percent.

The implication is clear enough. The more of this kind of pasture a dairy farmer has, up to the limit of his needs, the more milk he is going to get and the more money he stands to make. Many irrigated sections of the West are handicapped by long distances to market, thus making it more profitable, except for certain specialty crops, to follow systems of farming that market crops as livestock products.

Irrigated pastures also are doing yeoman's service in the cattle- and sheep-raising West by balancing feed needs while conserving the soil. The Nevada Experiment Station has demonstrated these pastures to be the solution, when a stockman's irrigated hay lands yield feed enough to carry more livestock during the winter than his available range can carry safely during the summer. The irrigated pasture enables him to stretch his range to balance off his supplies, because he can graze it during early spring and late fall, before and after his stock is on the range.

Ranchers in the Mason Valley Soil Conservation District out of Yerington, Nev., find that seeded irrigated pastures produce 50 percent more feed than do native meadow pastures. G. Francesconi is one of them. He has 40 acres of district-planned grass-legume pasture that has been giving him 4 animal unit months of grazing and a ton and a half of hay an acre.

Even if higher production were not a primary object, as it is in these war days, the place that properly seeded and managed pastures have on irrigated farms has been demonstrated. Though such improved irrigating practices as growing cultivated row crops on the contour or across the slope, using appropriate lengths of water runs and the use of smaller heads of water, are invaluable in making possible safe cropping of much sloping irrigated land, there are limits to which such practices can be developed economically, and there are sloping fields of certain soil types on which even such measures cannot assure safe intensive cropping. Pasture and hay crops are the answer under such conditions.

Other land problems, including alkalinity, high or fluctuating water tables, and shallow soils likewise point to a potentially greater use of pastures on irrigated farms. Of the major cultivated crops, only sugarbeets, milo, sorghum and cotton com-

pare favorably with adapted pasture grasses and legumes in tolerance to rising salinity; and none of the cultivated crops, except rice, will stand periods of submergence or a high water table as well as will many pasture species. Therefore, where adequate drainage and alkali removal for growing rotation crops are difficult and costly, pasture appears the sounder and more profitable use of the land. Providing year-around ground cover, it reduces evaporation and thus prevents excess accumulation of salts on the surface, becoming important in reclaiming alkali lands.

Shallow-rooted, grass also grows on soils too shallow or stony to be tilled. Walter Mathiesen of Filer, Idaho, testified to this virtue of pasture grasses: "Irrigated pasture made me $100 per acre on shallow soils," he said, "as compared to 10 sacks of beans (valued at approximately $70) on similar soil in our adjoining field. I didn't get any erosion from irrigation on the pasture, and the only expense was for irrigating and going over it once with a mower to get rid of weeds and coarse grass."

In the Wood River Soil Conservation District, in southern Idaho, bringing new land under irrigation is a slow and costly task, as much of it is covered with surface rock and sagebrush that must be taken off before it can be prepared for cultivation. Particularly in view of war-time labor shortage, many district farmers are developing what they call "roughed-in pastures." In order to obtain some income from such Class III and IV lands while the better Class II land is being developed, mixtures of cheaper grasses are broadcast by hand; and the seeded areas are irrigated by sheet flooding or with deep corrugations or furrows three or four feet apart, often with waste water from crop fields. The roughed-in pastures are cleared and leveled later on, meanwhile yielding surprisingly large amounts of forage.

"Roughed-in" pastures are not, of course, a substitute for properly cleared and leveled irrigated pastureland. Land preparation pays as high dividends for pasture planting as for any other irrigated farming. The conventional irrigating method in the Pacific Coast region for pastures is with borders. In some localities, contour irrigated pastures have found favor, under conditions making this method less expensive than the straight border method for land leveling and preparation, and more convenient and effective to manage.

Pasture as a rotation crop is unexcelled for keeping up soil fertility, both the sod itself and the manure from grazing animals returning large amounts of organic matter to the soil, to be drawn upon in turn by cultivated crops. The pasture rotation experience of F. E. Roberts, Yakima County, Wash., dairyman and Extension demonstration farmer, have attracted wide attention. Not only are the pasture yields high on his farm near Sunnyside—3½ animal unit months to the acre for a 7-month grazing season as contrasted to the local average of only 1½—but other crops in the rotation have benefited proportionately: 40 tons of ensilage corn per acre, and a 4.4-ton yield on the first cutting of a new alfalfa-and-grass field, compared to the valley's yield for an entire season of only about 5 tons per acre.

More pastures in irrigated acres is but half the story: improved management is the other half. Pastures too often are limited to the poorest land and receive the least attention. Good irrigated pasture management practices favored by Pacific Coast farmers include use of improved, locally adapted seed mixtures, careful seedbed preparation, adequate land preparation and application of water at the right times and in the right amounts, fertilizing, weed control and grazing management.

Neglected pastures on irrigated farms of the West offer greater opportunities for management improvements than for any other crop. The high yields from the Roberts pasture, for example, are attributable to management—12 to 15 tons of manure applied to the acre before seeding, use of improved species, rotation grazing with clipping and harrowing after each grazing cycle, and biennial applications of 200 pounds of treble superphosphate per acre.

Fitting the method of irrigation to the field conditions and water supply, and land preparation consistent with the method of irrigation to be used, are essential to most efficient use of irrigation water. Changing from wild flooding to borders and corrugations on the Hiram Hanson farm in the Oneida Soil Conservation District in southeastern Idaho saved enough water to irrigate an additional 28 acres and cut the irrigating time from 114 to 72 hours. Slope of land, character of soil and subsoil, and available head of water, usually determine the system to use. High efficiencies of water use and high yields of pasture depend upon applying water in desired amounts and frequencies to meet plant and soil needs.

In a study of 205 farms in eastern Oregon, the Oregon Agricultural Experiment Station found that improved, mixed tame grass pastures produced 240 animal unit days of grazing to the acre,

Well-filled cows on irrigated pasture of the F. E. "Sandy" Roberts extension demonstration farm in Yakima County, Wash.

as compared with 152 from straight bluegrass pastures. Though cost of maintenance was higher for the mixed pastures, the increased yields resulted in a grazing cost of only $1.41 per head per month on the mixed pastures as against $1.56 on the bluegrass pastures.

There likewise is ample evidence of the value of pasture fertilization and proper irrigation. In one study, the Oregon station found that a 300-pound application of 16 percent superphosphate increased yields 75 percent. At the Caldwell, Idaho, Experiment Station, increasing the number of irrigations during the season from 5 to 7, and using a 12.5-load application of manure, boosted yields 58.7 percent. Liquid manure put on irrigated pasture at the Western Washington Experiment Station increased yields 27 percent. This station also found that rotation grazing increased pasture yields approximately 9 percent.

Clipping to control weeds that rob pasture plants of needed nutrients, and harrowing to scatter droppings that cause unpalatable patches of grass to develop, are other good management practices that increase carrying capacity.

IRRIGATED MOUNTAIN MEADOWS

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sential, irrigated pastures have a definite function on most irrigated farms. The use of better mixtures of adapted species, of grasses and legumes, improved irrigation methods, and pasture management will allow the irrigated pasture program to expand, and at the same time provide favorable economic returns and assist in the maintenance of soil fertility.

TAKE CARE OF THE RANGE

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had this to say concerning some 1,000 acres of such land he manages:

"Before seeding, an acre of this land wouldn't furnish enough pasture to pay the taxes. It took 15 acres to carry a cow and a calf for a month. Now, one acre does the job."

Good results in establishing profitable range forage also have been achieved on burned-over lands, whether on slash-burned timbered areas of south-central Washington or on burned sagebrush lands of southern Idaho. In the Underwood, Wash., district, for example, the grazing capacity of a 500-acre burned-over woodland range area was increased an estimated five times over that of identical unseeded burned land in 1943 as a result of 1942 fall seeding by the J. Neils Lumber Company with the cooperation of the Glenwood Cattle Association and district technicians.

By their works ye shall know them, truly may be said of conservation range-management practices. It is significant that at the 1944 meeting of the Washington State Cattlemen's Association, 3 of the 5 officers and 10 out of 11 resolutions committee members were soil conservation district supervisors.

The National Victory Garden Conference, Washington, D. C., recommended that continued and increased emphasis be placed on Victory gardens in 1945.

IRRIGATED PASTURES ARE A "MONEY CROP"

By J. G. HAMILTON

Grade Herefords "full fed" on this permanent irrigated pasture compare favorably with best pen-fattened stock. They received no supplementary ration.

Planting irrigated pastures on $200-an-acre land is more profitable than growing cotton and other "cash" crops, according to Willard Welker, of Safford, Ariz. Mr. Welker finds that on the present livestock market the income from his pastures exceeds $100 per acre—more than from the rest of his land after labor costs are deducted from gross returns.

Welker is particularly pleased with the success of his new "crop" because it was planted on land that was in cotton and corn for 13 straight years and had lost much of its fertility.

The owner of 547 acres of cultivated land in the Gila Valley Soil Conservation District, Welker has had 30 years experience in the production of sugar beet seed, barley, cotton, alfalfa, corn, grain sorghums, and other crops.

Cotton has for several years been his most important source of cash, but he has always been alert for any new crop that could be used to advantage in his farming system. Although he had grown annual pastures to supplement fall and spring grazing on small grains, he had not considered it practical to plant perennial mixed grass-legume pastures on high-priced irrigated farmland.

The pastures were introduced to the general area in 1940 when Mervin L. Wallace, area agronomist for the Soil Conservation Service, interested a dairyman and another livestock farmer near Duncan, Ariz., in seeding experimental tracts. These grass-legume plantings were highly successful, and in 1941, when the Gila Valley Soil Conservation District was organized and Wallace was made district conservationist, he used them to convince two Safford Valley farmers that irrigated pastures should be equally profitable in their locality.

These demonstration plantings also were successful, and 14 additional pastures with a total area of 218 acres were planted in 1942. A total of 1,253 additional acres was seeded by 49 farmers in 1943, and 51 farmers are planting 950 acres this year.

Although these plantings may not appear impressive to persons thinking in terms of Midwestern agriculture, they represent more than 7-1/2 percent of the total irrigated acreage in the Safford Valley—a sizable percentage for a new crop within three years after its introduction.

At first Mr. Welker was content to study the operations of his neighbors before adopting a perennial pasture program on his own farm. He

EDITOR'S NOTE.—The author is regional chief of the agronomy division, Soil Conservation Service, Albuquerque, N. M.

knew what to expect from proved cash crops, hay crops and annual pastures, and he did not care to introduce a new crop blindly.

By 1943, Welker was convinced that mixed grass-legume pastures could compete with so-called cash crops, as well as with hay and pasture. He was not convinced, however, that the standard mixture being used in the Valley was the best possible one. District Conservationist Wallace and County Agent Steve Owens encouraged him in his quest for added information, so in 1943, he planted 22-1/2 acres to 11 different mixtures, including the standard mixture used by most of his neighbors, and a commercial mixture that was being recommended. The Soil Conservation Service nursery and State Extension Service cooperated in this trial planting and suggested 9 of the mixtures.

Temporary pastures of barley and Sudan grass were used to supplement the mixed grass-legume pasture plantings. In late November, 1943, Welker bought 146 head of grade Hereford calves. Their average weight at time of purchase was 412 pounds. Up to September, 1944, the different pasture mixtures had provided 27,605 days grazing. Since the average weight of animals already sold and those remaining on pasture was, approximately 800 pounds, it is estimated that the combined mixtures produced 1.99 animal units grazing the first year (unit based on 1,000 pounds weight).

In June, Welker sold 37 head of cattle fattened on the pasture at 14 cents for the steers and 13 cents for the heifers. It is interesting to note that the top price paid for pen-fattened cattle in Los Angeles that day was $14.65 per cwt. The animals in Mr. Welker's consignment received no fattening ration, other than the pasture mixture. The remaining animals were fed a supplementary ration of grain beginning the first part of November, 1944.

The 11 study plots were divided into four separate fields, but only two fields were grazed regularly. Mr. Welker discontinued using the other two, because they had alfalfa as one of the legumes in the mixture, and he lost two of his animals from bloat after they were placed in them. Two others died from unknown causes.

Asked for comments on the different mixtures and some "do's" and "don't's" that he would like to have passed on to inexperienced pasture operators, Welker said that it was still too early to give a definite answer on the mixtures, but that a few facts had been established, at least to his satisfaction.

Level land and a firm, well-prepared seedbed are essential to growth of good irrigated grass-legume pastures. This farmer makes shallow furrows with cultipacker in preparation for broadcasting seed mixture. The seed will be covered with same implement.

Where perennial pastures are desired, he would recommend that no strong-growing annual grass species be included in the mixture. He also would hold down the seeding rate of perennial rye grass because of its vigorous competitive growth habits that retard the establishment of the slower-growing, longer-lived perennials that are not so vigorous during the first few months of their growth. He can see no need for the large number of species that ordinarily are recommended in pasture mixtures, because he has observed that many of these will disappear within a year or two, or their growth will be so retarded that they have little permanent value in the mixture.

Since several of his animals bloated while they were grazing on the pastures containing alfalfa, notwithstanding close supervision, he prefers to leave alfalfa out of his pasture mixtures. The cattle grazing on the mixtures containing sweet clover, alsike clover, ladino clover, button or bur clover were not affected. He says that he is convinced that the bloat hazards of alfalfa in the Safford

Valley are far greater than those in the Salt River and Yuma valleys in Arizona and the Imperial Valley in California, where alfalfa is grazed successfully. He also believes that alfalfa in the mixtures retards the establishment and growth of most of the grasses, whereas the other legumes appear to improve the growth—particularly when they do not constitute more than one-half of the volume.

Among important "don't's" he would say, do not overgraze. More feed and more beef will be produced on an undergrazed pasture than on one that is overgrazed. Use enough livestock to graze the pasture off, and then rotate. Do not graze pastures when the ground is wet—this is particularly important during the first three or four years of the pasture's life or until a good strong sod cover has been formed.

Welker's practice has been to put his livestock "on" five days and "off" seven days. Two pastures are the minimum required for good management but three or more are preferable. If the pasture is too large for the number of livestock to graze properly during the period, it should either be reduced in size, the number of livestock should be increased, or mowing should be done to prevent patch grazing. However, Welker considers mowing to be a poor substitute for good management. Management should be such that patch grazing will not be a problem.

He advocates the same careful land leveling and seedbed preparation that is required for alfalfa. In other words, he wants the elimination of high and low spots, and a well-prepared, compact seedbed. He cautions against planting pasture seed too deep, and suggests a planting depth of from one-fourth to one-half inch.

Welker prefers to irrigate by the border method, using corrugations or shallow furrows. The latter are particularly desirable if the soil tends to be "tight." The corrugations should be spaced so that the water will "sub" through in a reasonable time with a minimum loss through deep percolation. For his soil, he finds 16 inches a proper spacing. Length of irrigation runs, within reasonable limits, should be determined by the cost or scarcity of irrigation water, he believes.

He says that water moves through a properly managed grass-legume cover much more slowly than through an alfalfa field, and where the scarcity of irrigation water or its high cost is a problem, he suggests that the runs be reduced from one-third to one-half the length of those used for alfalfa, and that the borders be high enough to permit trampling down by livestock and still be capable of holding the irrigation "head." For his soil type, irrigation every two weeks during the grazing season keeps the pasture in thrifty growing condition.

Mr. Welker also observes that the irrigated mixed grass-legume pasture has a lower insurance risk than any other crop when it comes to damage by hail, cloudbursts, flooding, soil erosion, and insect and disease pests. He is convinced that irrigated perennial pasture plantings not only will be increased throughout the irrigated portions of the country, but that their value will be increased as we learn more about the sustained behavior of the different grass and legume species under various climatic and soil conditions.

PLANT VIGOR AND RANGE PRODUCTION

By J. L. LANTOW

Merely to be alive is important, but to have abundant health is still more important. This is as true of plants as of animals. Certainly a healthy, vigorous plant or animal has the advantage when competing with an unhealthy one, and who would question which would provide the more forage, beef, mutton, or milk?

Forage plants can live without livestock, but livestock cannot live without forage plants. Too often it is the case that the forage plants cannot live, or live only in a weakened condition, because of their treatment by livestock. Actually they both could be a great help to each other. If this could be, why not have it so?

The care of a range demands frequent diagnosis of conditions on range or pasture. The good diagnostician sizes up the situation correctly, and if he doesn't know the treatment he can look in the book to see what to do. Doctor and range operator have similar problems which call for both knowledge and experience. There is this difference: people who do not feel well go to the doctor and tell their story; ranch operator must go to the range himself to discover what is wrong. There is none so blind as he who does not know how to see. To see the things that are happening on the range, sight alone is not enough. You must know how to

EDITOR'S NOTE. — The author is regional chief of the range division, Soil Conservation Service, Albuquerque, N. M.

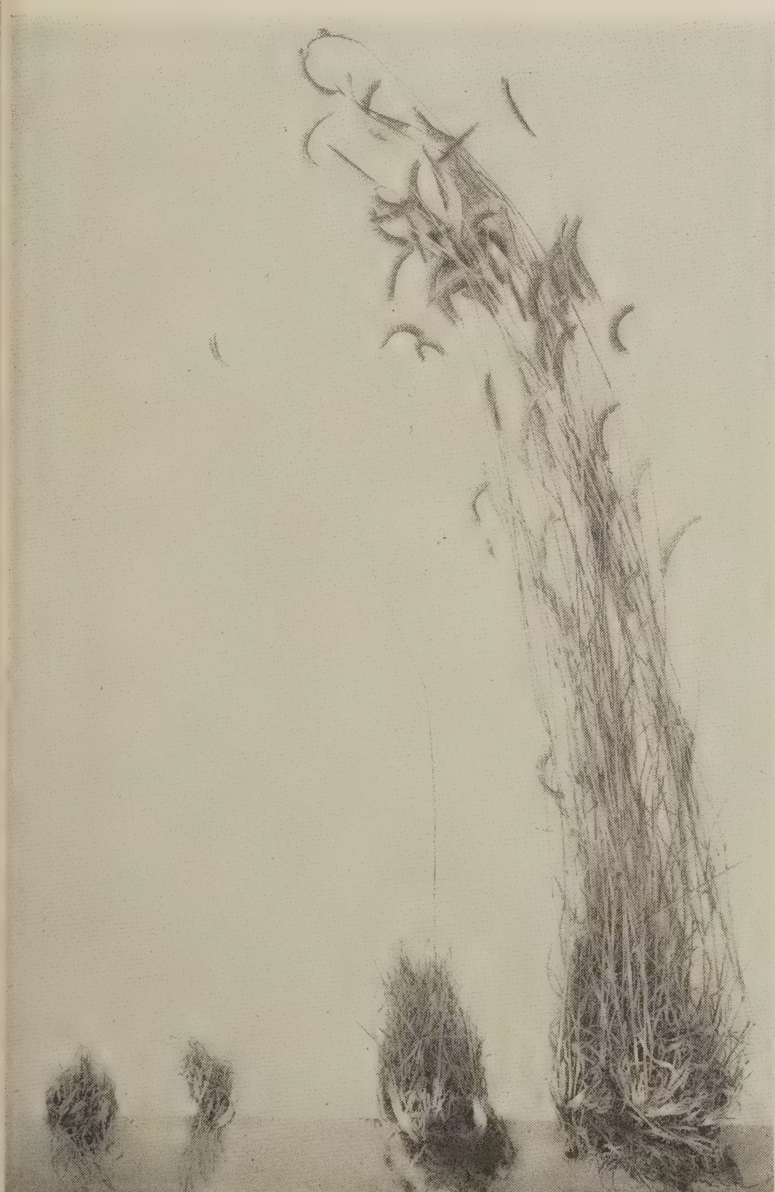
read the story of the range after you see it. Our ranges are so much Chinese to too many range advisors and operators.

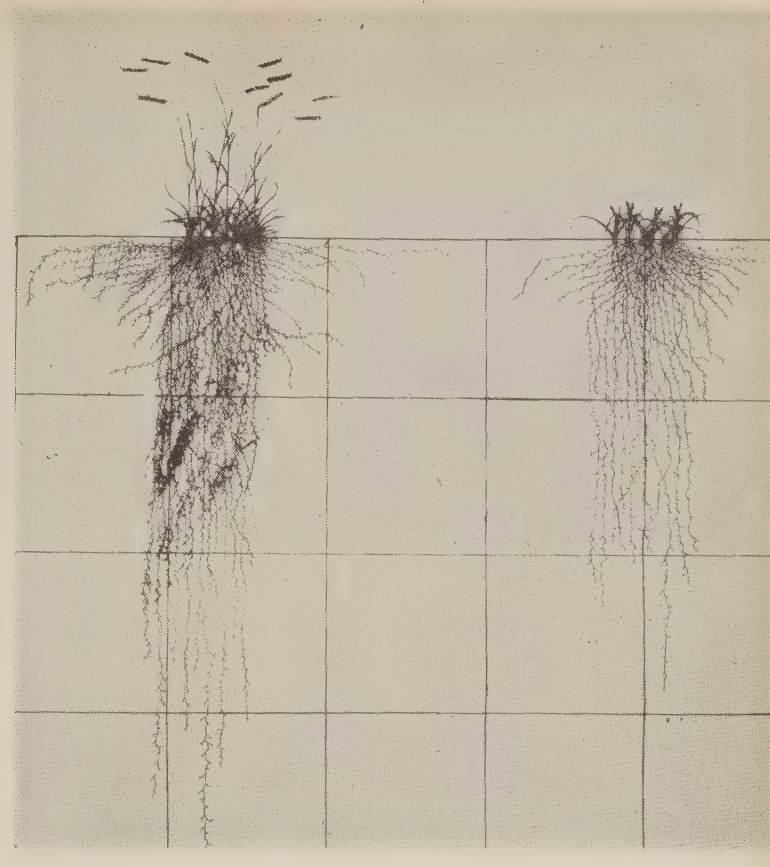
Health and vigor determine plant competition and forage production.

Vigor in forage plants is almost synonymous with health. It is the driving force which governs poor production or good production; and decides whether certain forage plants can compete favorably or unfavorably with less desirable ones. Vigor certainly is the key to plant succession. If vigor is so important, how do we recognize it, and what do we do to build it up? A few simple guides help in recognizing vigor.

1. Large stem and leaf growth, speaking comparatively.
2. For the bunch-type grasses, a bunch-type growth at the base of the plant or tuft, with no undue crowding.

Successive stages in loss of vigor are shown in these blue grama grass plants. Compare the amount of forage produced by the plant at right with that of the two at left.





Repeated close grazing during growing season shortened root system of plant on right. Plant on left gets more water and food, and produces more than plant at right. Since it is healthy, it will be able to compete well with poor species that try to invade the range.

3. Good volume growth or good height in average or favorable rainfall years.
4. Early spring growth, if moisture is available.
5. A well-developed and deep-root system.

It may be well at this point to inject the reminder that plants in a state of high vigor may die, or a portion of the tuft may die, from lack of moisture. If a portion of the tuft dies, due to lack of moisture, but the plant has not been penalized by use, it is quite likely that when there again is enough moisture and a suitable temperature prevails, the plant will grow quite luxuriantly, indicating that its loss of vigor was only temporary. Such plants retain an adequate root system and have food stored in the portion of the crown or roots that remains alive. If enough density is lost, however, other plants can invade. In some types of plants too great a density results from close grazing. Some bunch-type species then will take on a sod-forming aspect. When this occurs, vigor is lower than it should be.

There is a great deal of difference in results when the plant is low in vigor. A weakened plant lacks the food reserve and the root system to respond to rainfall or recover after a drought. The

plant starts to grow, but its low vitality does not allow it to produce the volume of the vigorous plant. The vigorous plant has the root system to compete with the plants of its kind and with any other species that may be at hand. For some reason, our most desirable plants ordinarily dominate over the less desirable forage plants, or even the undesirable forage plants, provided they are not penalized by misuse.

Let there be no mistake. For the most part the plants that we see are present because we gave them a chance in one way or another. The whole story, then, is that the healthy, vigorous plant is able to compete with other species and produce more than the less vigorous plant. The desirable grasses, if vigorous, prevent the invasion of the plants we do not want.

Training of people to use tools in performing the operation for which they were designed is highly important. Too often, however, the tools become all important, and the operation only secondary. On the range, both novice and veteran

Five years ago these two pastures looked alike. Proper grazing since then on tract to left of fence made the difference. Grass on that side has regained its vigor and almost eliminated snake weed.

need to put into effect only a few basic management practices to get result. Science reveals to us that vigor of plants is affected adversely by:

1. Too *early* use.
2. Too *frequent* use.
3. Too *close* use.

If the best vigor and the highest plant production are sought all *three* of the above dangers must be avoided. Don't fool yourself, you can't ignore them and bring in high production. It's as important to have the right idea about plant growth as to have a perfect range management plan.

Project your management of the range on the feed available rather than upon what you think you may get. Then, there'll be less worry about when it's going to rain.

IRRIGATED PASTURES SOLVE BINDWEED PROBLEM

By PAUL G. MOORE

Members of the Minersville Soil Conservation District have discovered a simple cure for two of the worst plagues farmers have to fight—alfalfa wilt and bindweed infestation. It is not only a simple cure, but a highly profitable one. The cure is grass.

When the Minersville district—the first soil conservation district in Utah and in the Southwest region—was organized back in 1938, the livestock forage problem was critical. Many fields of alfalfa had a total yield of less than 10 tons to the acre from the time they were planted until the wilt killed the stand completely, usually in three or four years. As the alfalfa died out, the morning glories came in. A number of farms were abandoned because of the heavy cultivation expense and low yields caused by the infestation.

The competition of the weed also made it difficult to grow small grains or row crops. Clean cultivation, in conjunction with the use of chemicals such as sodium chlorate and carbon bisulphide, did not offer a solution to the problem, because of the great amount of effort and expense involved in eradicating large and well-established bindweed stands, and the soil sterility that usually follows such treatment.

Editor's Note.—The author is in the current information section, Soil Conservation Service, Albuquerque, N. M.

Experimental plantings of mixtures of grass and alfalfa for hay, and of irrigated pasture grasses were begun at once, under the guidance of Soil Conservation Service technicians working with the district. The experience of Darwin Marshall is typical of that of farmers who tried the mixed hay idea as an answer to their problems.

Mr. Marshall bought an abandoned farm from the state a few years ago. The former owner had given it up as worthless, due to the heavy infestation of wild morning glory, and low fertility. When he began cultivating it again, the yield of alfalfa was about one ton per acre, and other crop yields were correspondingly low.

Knowing that he was playing a losing game against the bindweed and poor soil with both his alfalfa and his row crops, Mr. Marshall decided to try the grass-alfalfa farming idea. Where he had been attempting unsuccessfully to grow corn, he planted a mixture of alfalfa, orchard grass, smooth brome, and crested wheatgrass.

The land was fall-plowed to a depth of from 12 to 14 inches. It was harrowed, floated, and seeded in a firm seed bed. That didn't daunt the morning glories, of course—they came up again, and were doing fine. But, gradually, the grass began to turn the tables on the weed. Instead of being choked out itself, it began choking out the "glories."

Mr. Marshall's plantings are four years old. Instead of getting one-ton alfalfa yields, he has been cutting from five to six tons of mixed hay for the last three years, and the crop is increasing, instead of decreasing, as it had when alfalfa was planted alone.

The bacterial wilt has been killing out alfalfa all this time, of course, but as the alfalfa stand has decreased it has been replaced by grass instead of bindweed. There are still some vines in the field, but they are losing out in the competition.

This hay is helping to build up Mr. Marshall's farm indirectly in another way. He is adding to the fertility of that poor soil by applying about 10 tons of manure per acre.

Pleased with the success of his mixed-hay planting experiment, Mr. Marshall seeded an additional five acres of alfalfa and grasses last year and obtained an excellent stand.

The farmers in the district are agreed that it is inadvisable to include crested wheatgrass in the mixtures, due to its poor yield under local conditions. They also recommend a seeding of 30 pounds per acre instead of the 22 pounds as suggested for land that is free of weed infestation.

The methods of seed-bed preparation that they have been using depends, of course, on the previous crop. Results, they say, are better when a cultivated crop such as corn is planted a year or two preceding the seeding of the land to grass. This weakens or destroys "weed" grasses that otherwise might compete with the new crop.

The fields to be planted are generally plowed in the fall, and harrowed the following spring until a fine, firm seedbed is obtained. Although some farmers use a hand broadcaster to seed grass, drilling usually has produced more satisfactory results, since it permits a better distribution of seed and covers it at a uniform depth for quicker and more even germination. Grass seed must not be planted too deep—about one-fourth inch is the correct depth.

Irrigated pastures like this enable Utah ranchers to balance feed budgets, and Utah dairymen to boost State's milk cow population from 105,000 in 1941 to 121,000 in 1944. Members of Minersville Soil Conservation District find that permanent pastures and mixed hay plantings are important, also, for other reasons. Grass ended their bindweed, alfalfa wilt and erosion worries.

Spring seeding should be done when the ground has warmed enough to permit maximum germination. It should be completed early enough during the summer to permit at least two irrigations, according to Stanley McKnight, one of the Minersville district supervisors.

The use of small, narrow furrows for irrigating, with a 22-inch interval between them is favored by most members of the district. A 2- or 3-inch application of water per acre is suggested.

In planning the irrigation system, the type and depth of soil, slope of land, time of plowing, and density of grass stand must be considered. For a sandy loam with a slope of one percent an a thick stand of pasture grasses, the runs should not exceed 300 feet, and the width of strips, 50 feet, if about 3 cubic feet per second of water are used. In heavy soil, runs should not be longer than 600 feet, and the width of strips 100 feet, for the same amount of water. However, the exact width of strip and length of run must be determined by trial and use of a moisture probe to determine water penetration.

An added advantage of grass farming in the Minersville area is that it is making it possible to irrigate safely much of the sloping land that was subject to severe erosion under other types of cropping, and was bringing in little financial return.

Suitable grass mixtures vary greatly in Utah according to the climate, altitude, and soil type, and farmers should consult their county agent or district conservationist before buying seed.

Proper maintenance of the pasture is just as important as getting a good "stand." Droppings should be scattered with a brush drag or harrow early in the spring, and in the summer following the rains to prevent killing spots of grass; this will usually mean harrowing three or four times. Yearly applications of from 5 to 10 tons of barnyard manure and 100 pounds of treble superphosphate per acre have proved very beneficial.

The pasture should be clipped as often as necessary to get rid of weeds, and to stimulate new growth in clumps of grass.

Cows should not be turned into the pastures until the growth of grass reaches four to five inches, and then only when the soil is dry enough to be firm. Rotation between two or three pastures will result in a higher production of nutritious forage, and healthier stands of grass.

One thing that some farmers tend to forget is that over-grazing of an irrigated pasture is just as disastrous as overgrazing of the native range.

CRESTED WHEATGRASS HELPS CONTROL BINDWEED

By WILKIE COLLINS, Jr.

EDITOR'S NOTE: Research by the Department on the control and eradication of bindweed bears out the experiences of farmers related below. Some grasses and mixtures of grasses suppress the growth of bindweed. Experiments have shown, however, that bindweed seed hold over in the soil for as long as 30 years. and even the puny growth in pasture mixtures produces viable seed that makes a return of the land to cultivation a hazardous venture.

Creeping jenny . . . field bindweed . . . wild morning glory!

Those are some of its better known common names. But descriptions of this weed and what it does to crops provokes more sultry language than almost any pest which plagues farmers. Thomas Ptak, near Dante, South Dakota, calls it "the worst bandit ever to visit the State."

Not a local problem, bindweed costs the farmers and ranchers in the Northern Great Plains several million dollars a year through reductions in crop yields and the costs of attempting to control it. It is present in every county in North and South Dakota, also widespread in Kansas and Nebraska—especially severe in the eastern half, and is invading Montana and Wyoming.

A persistent perennial vine, bindweed uses moisture needed for the production of crops and strangles plants growing in the same land with it. When moisture is plentiful, bindweed reduces yields sharply; in more nearly normal years it will choke off crops entirely in the less humid areas.

Treatment with chemicals or intensive cultivation for a minimum period of three years are the better known methods of controlling bindweed. Both methods are expensive, and in addition take the treated areas virtually out of production for some time. There is definitely an investment relationship between the crop producing capabilities of land and the expense of bindweed control.

But there is a brighter side. Hated as it is, bindweed is not the least influence in getting good land use in extensive areas in the less humid portions of the Northern Great Plains. It has infested thousands of acres whose crop production will not support the expense of controlling it chemically or through intensive cultivation.

This land is being seeded to crested wheatgrass —much of it has been classed by conservationists as best suited for grass, anyway—with the result that it is being brought into higher production. Actually some of the fields had been abandoned for cultivated crops, principally because of bindweed.

David Peterson, near Kadoka, cooperating with the Badlands-Fall River land utilization project, gives a graphic description of what bindweed does to crops in the less humid areas. He was one of the first to plant crested wheatgrass in infested fields.

"The seeding was made in the fall of 1937 in a 40-acre field," Peterson said, "In 1935, the corn there got only about 5 inches high before it was choked out by the bindweed. But corn in an adjoining field, where there was no bindweed, yielded 20 bushels an acre."

An early growing plant, crested wheatgrass attains considerable height before bindweed starts its year's growth. It also uses the spring moisture before the bindweed gets going. Under the double handicap, without adequate sunlight and robbed of much of the moisture supply and available plant food, the bindweed does poorly indeed.

"We seeded the field in strips," Peterson explained. "I didn't think that the grass would come up because the bindweed was so thick. It showed up in the strips the first year, but it was three years before it started to spread between the strips and another three years for the grass to cover the whole space between."

Now, at the end of 8 years, only occasional bindweed plants are found in the old strips, and they are far from thrifty. In between the seeded strips the bindweed is suppressed but more plants are to be found.

Peterson estimates that crested wheatgrass seeded in strips takes twice as long to suppress bindweed as when the whole field is seeded. His estimate is based on some experience.

"In 1935, 1936 and 1937," he said, "we had a half-acre garden near the house. We tried to hoe it every week, but the bindweed took over. In the fall of 1937, I seeded crested wheatgrass. It grew so well that in 1942, 1943 and 1944 I cut an average of a ton of hay per year from that half-acre. There is only an occasional, very spindly bindweed plant there now."

Peterson has never mowed the 40-acre field, using it for pasture entirely. It's good pasture, he said. Nevertheless, he estimated that he could cut a ton to a ton and a half of hay per acre there in 1944 if he had wished.

Investigations by Edgar A. Joy of Brookings, S. D., a Soil Conservation Service research employe cooperating with the South Dakota experiment station, support the experiences of farmers in general, and in addition seem to establish the importance of crested wheatgrass' early use of

This is the 50-acre field "solidly infested with bindweed" which E. J. Rubendahl seeded to crested wheatgrass in the fall of 1941. It is near Artesian, S. D. In 1944 it produced a crested wheatgrass seed crop of 200 pounds an acre. One small patch of bindweed is seen in the foreground, but the grass has pretty well suppressed the weed throughout the whole field. The photograph shows that the bindweed plants didn't do so well in competition with crested wheatgrass.

moisture in suppressing bindweed.

Last year in a field test, after a very wet spring with abnormally high rainfall, Joy reports, he found the soil in crested wheatgrass strips rather dry below the one-foot level. On areas not in grass, the soil was wet for a depth in excess of three feet. The probability is that the crested wheatgrass used up the moisture before the bindweed could make sufficient growth to compete.

Near Phillips, S. D., Joy reports, is one field of crested wheatgrass where bindweed is well under control but the infestation on the adjacent roadside is heavy. And on both the Robert Roth and G. F. Buel farms near Rapid City, S. D., a few bindweed plants are still present in the drainageways even though the crested wheatgrass seems to have eliminated bindweed plants from the rest of the field.

The presence of bindweed has had no apparent effect on the yields of crested wheatgrass either for hay, seed or pasture, probably because the bindweed is not in a position to compete with so early a growing plant as crested wheatgrass.

Consequently, many thousands of acres of land have been restored to production often greater than when it was in crops even without bindweed competition. Fields which had become so heavily infested as to be abandoned are being brought into production which can be computed in terms of many thousands of pounds of beef, mutton and wool.

REFERENCE LIST ☆☆

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SOIL CONSERVATION SERVICE

Rates of Sediment Production in Southwestern United States. SCS-TP-58. Soil Conserviation Service, January 1945. Processed.

Report on An Investigation of Water Losses in Streams Flowing East Out of the Black Hills, S. D. Special Report No. 8. Soil Conservation Service. October 1944. Processed.

Report on the Reconnaissance Sedimentation Survey of Radford Reservoir, Radford, Va. Special Report No. 7. Soil Conservation Service. November 1944. Processed.

OFFICE OF INFORMATION U. S. DEPARTMENT OF AGRICULTURE

The Control of Reservoir Silting. Miscellaneous Publication No. 521. Soil Conservation Service. Slightly revised, October 1944.

Getting Started in Farming. Farmers' Bulletin No. 1961. Bureau of Agricultural Economics. November 1944.

Steer Clear of "Land Mines": Farmers Prepare to Guide Veterans Toward Sound Farming Opportunities. Extension Service, War Food Administration, November 1944. Processed.

Thirty Years of Extension Work. Reprinted from Land Policy Review, Extension Service. Fall 1944.

STATE BULLETINS

Canal Lining Experiments in the Delta Area, Utah. Technical Bulletin No. 313. Agricultural Experiment Station, Logan, Utah. June 1944.

Commercial Vegetable Recommendations: Varieties, Fertilization, Seed and Soil Requirements for Georgia. Circular No. 322. Agricultural Extension Service, University of Georgia, Athens, Ga. Revised March 1944.

The Corn Belt Family Farm in an Industrial Era. Circular No. 294. Agricultural Experiment Station, Columbia, Mo. June 1944.

Corn in Georgia. Circular No. 320. Agricultural Extension Service, University of Georgia, Athens, Ga. March 1944.

Cull Peas for Fattening Calves. Bulletin No. 439. Agricultural Experiment Station, Pullman, Wash. April 1944.

Disk Plows. Circular No. 325. Agricultural Extension Service, University of Georgia, Athens, Ga. March 1944.

Education of the Farm Population in Minnesota. Bulletin No. 377. Agricultural Experiment Station, University Farm, St. Paul, Minn. June 1944.

Farm Size in Relation to Land Use, Yields, Volume and Value of Production and Total Nutrients, Overton County, Tenn. Rural Research Series Monograph No. 173. Agricultural Experiment Station, Knoxville, Tenn. 1944.

Fifty-third Annual Report for the Year Ending June 30, 1943. Agricultural Experiment Station, Tucson, Ariz. 1944.

General Agriculture in the High Schools of Iowa. Research Bulletin No. 327. Agricultural Experiment Station, Ames, Ia. May 1944.

Illinois Farm Economics, No. 110-111. University of Illinois, Urbana, Ill. July-August 1944.

Information on How to Grow Better Oats. Special Circular No. A71. Agricultural Extension Service, Agricultural College, Fargo, N. D. February 1944.

Ladino Clover for Western Oregon. Circular No. 161. Agricultural Experiment Station. Corvallis, Ore. March 1944.

Nitrogen Fixation, Composition and Growth of Soybeans in Relation to Variable Amounts of Potassium and Calcium. Research Bulletin No. 381. Agricultural Experiment Station, Columbia, Mo. April 1944.

Obtain Better Yields, Plant More Winter Legumes. Leaflet No. 41. Agricultural Extension Service, University of Arkansas, Fayetteville, Ark. Revised 1944.

Pasture, Grain, Hay, Fall-Planted Oats. Leaflet No. 64-64A. Agricultural Extension Service, University of Arkansas, Fayetteville, Ark. 1944.

Peanut Production in Arkansas. Leaflet No. 24. Agricultural Extension Service, University of Arkansas, Fayetteville, Ark. Revised 1944.

Revised Wartime Fertilizer Recommendations for Delaware. Wartime Extension Folder No. 3. Agricultural Extension Service, University of Delaware, Newark, Del. Revised July 1943.

Soybeans for Oil. Leaflet No. 23. Agricultural Extension Service University of Arkansas, Fayetteville, Ark. 1944.

Soil-Inhabiting Fungi Attacking the Roots of Maize. Research Bulletin No. 332. Agricultural Experiment Station, Ames, Ia. June 1944.

Timely Economic Information for Washington Farmers. Number 48. Agricultural Experiment Station and Agricultural Extension Service, State College of Washington, Pullman, Wash. November 1944.

The Uptake of Nutrients by the Cotton Plant When Fertilized with Acid Forming and Non-Acid Forming Fertilizers Combined with Different Rates of Potash. Bulletin No. 253. Georgia Experiment Station, Experiment, Ga., with the cooperation of the Bureau of Plant Industry, Soils, and Agricultural Engineering, Agricultural Research Administration, U. S. Department of Agriculture. September 1944.

Use and Cost of Farm Machinery. Bulletin P62. Agricultural Experiment Station, Ames, Ia. June 1944.

Vegetative Development of Inbred and Hybrid Maize. Research Bulletin No. 331. Agricultural Experiment Station, Ames, Ia. June 1944.

West Virginia Grasses. Bulletin No. 313. Agricultural Experiment Station, Morgantown, W. Va. May 1944.

Winter Barley in West Virginia. Bulletin No. 314. Agricultural Experiment Station, West Virginia University, Morgantown, W. Va. July 1944.

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WELLINGTON BRINK EDITOR

CONTENTS

Front Cover: Plowing strip in April on the Wagner Farm. Lancaster County, Pa. Photographer: George Lowary.

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"CINCHING UP" for the NEXT ROUGH RIDE

Hay stacks in reserve. These are as necessary to good range management as well-grassed pastures. They are a buffer against severe winters or dry spells. With a good feed reserve, the rancher can weather emergencies without having to abuse his grasslands.

By H. J. HELM

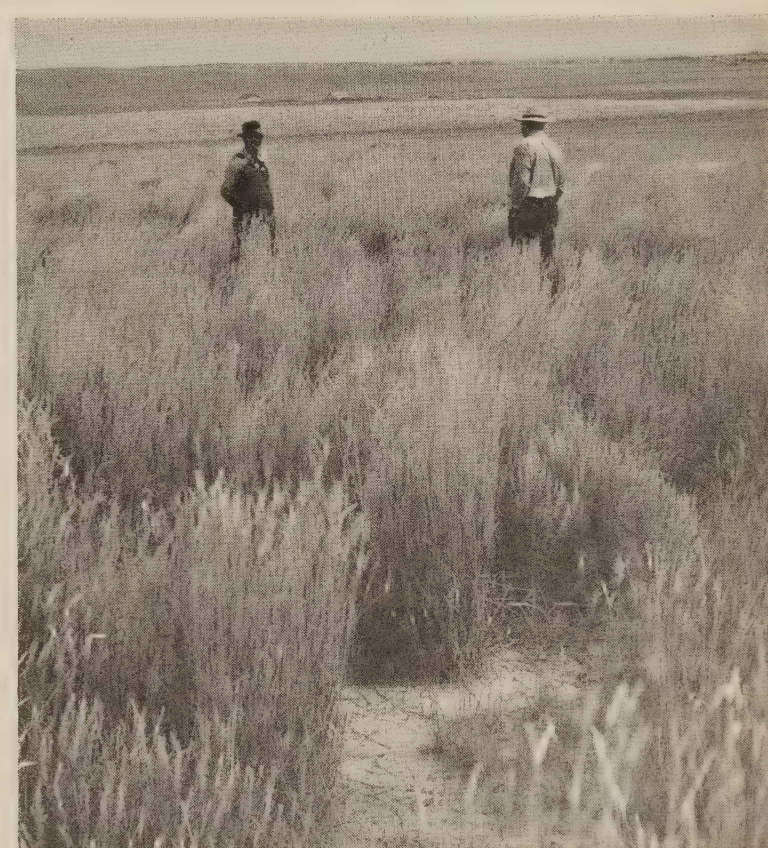
Range areas of the Northern Great Plains, in general, now have an abundance of forage. This is far different from the dreary period of 1934 through 1936, when many ranchers had to dispose of almost all of their livestock. Then there were many who feared the grasslands had been almost irreparably damaged.

Better management—some of it admittedly the direct result of heavy livestock sales, which reduced the numbers of animals on the range—helped start recovery. This, together with the abundant and timely rainfall of the last four years, brought the range lands back with a bang.

In other words, grasslands were given a chance to "get on their feet" before the war, and conservative stocking and ample rainfall put them in shape to absorb the one-two punches of record production.

Now, with the grasslands in productive condition, the job is to handle them so they will stay that way. Notwithstanding the abnormal times, characterized by mounting demands for food production and by shortage of labor, much progress has been made toward this end. Interest in better range management has intensified the technicians' job rather than simplified it.

EDITOR'S NOTE.—The author is chief, range division, Soil Conservation Service, Lincoln, Neb.



Crested wheatgrass on formerly cultivated land which had been abandoned for cropping. Small sagebrush and weeds had taken over the land when the grass was seeded, but crested wheatgrass now has gained almost complete ascendancy over competing vegetation. This field, left for seed last year, is capable of producing a lot of meat and wool.

Improvement in range management is profitable, sometimes spectacularly so. For example, the returns from moderate stocking on the Central Plains Experimental Range in Northeastern Colorado have been estimated at $742 per section, compared with $724 per section from heavy stocking.

Definite management plans already have been worked out for one-fourth of the nearly 54 million acres of pasture and range land in soil conservation districts in the Northern Great Plains, and on the 20-odd million acres included within land utilization projects, which are land-use demonstrations. Some of these plans are now fully in effect. Development of the newer ones has now started. More and more ranchers are working out similar plans with the help of the Soil Conservation Service technicians assisting the districts.

To date, adjustment in stocking the pastures has been accomplished on nearly half of the land in soil conservation districts for which conservation plans have been made, and on nearly all the land utilization projects. It is also progressing on other areas for which plans have been made.

Conservation marks the attitude of many ranchers, A group of eastern Montana ranchers declined to increase stocking rates on federally-owned lands in one project, because "we have good grass now, we intend to keep it good, and we might need the reserve grass for emergencies should a severe winter or drought come along." This, from ranchers whose production now is several times what it was a few years ago.

Range management includes many things in addition to harmonizing livestock numbers and feed reserves. It includes putting watering places where they can help management, rotation grazing to use grasses when they produce most, various devices to keep moisture on the land to boost grass production, and water-spreading on the more nearly level lands. Adequate water supplies located at the right places have proved to be probably the greatest single factor facilitating practical range management. More than six thousand watering places have been developed, eleven hundred of them being wells and spring developments and the rest dams. A little more than half are in land utilization projects.

Ward Stanley at Hot Springs, S. D., a cooperator with the Fall River Soil Conservation District, offers a typical demonstration of the significance of watering places in range management. He has 1,000 acres of range which he can use for but a few days at a time, after rains, because it is too far from any established watering place. He plans to build a dam there.

"The dams already built have resulted in better distribution of grazing," Stanley said, "and have helped to control the movement of stock. This distribution of stock undoubtedly brings a larger yield from the grass. In the drier years the dams will do much to help maintain production and keep the range in shape by distributing grazing. During such years I have seen the grass grazed to the ground near water, while farther away would be good, tall grass that wasn't touched."

Ranchers estimate that good distribution of water may increase the amount of feed available to stock by 10 to 25 percent. Apply the lower estimate to the 12½ million acres in soil conservation districts for which plans have been made, and the dams alone are making possible the maintenance of 50 thousand more cows and steers on the same acreage and without additional production of grass in the Northern Great Plains soil conservation districts.

Contour furrows or pitting of some pastures, and water spreading on others, help to produce more feed. Furrows have been built on 23 thousand acres of range lands included in the Northern Great Plains soil conservation districts, and water-spreading systems have been developed on some 16 thousand acres. Both of these practices are designed to make greatest use of moisture from snow or rain, but their application is limited by both soil types and types of rainfall.

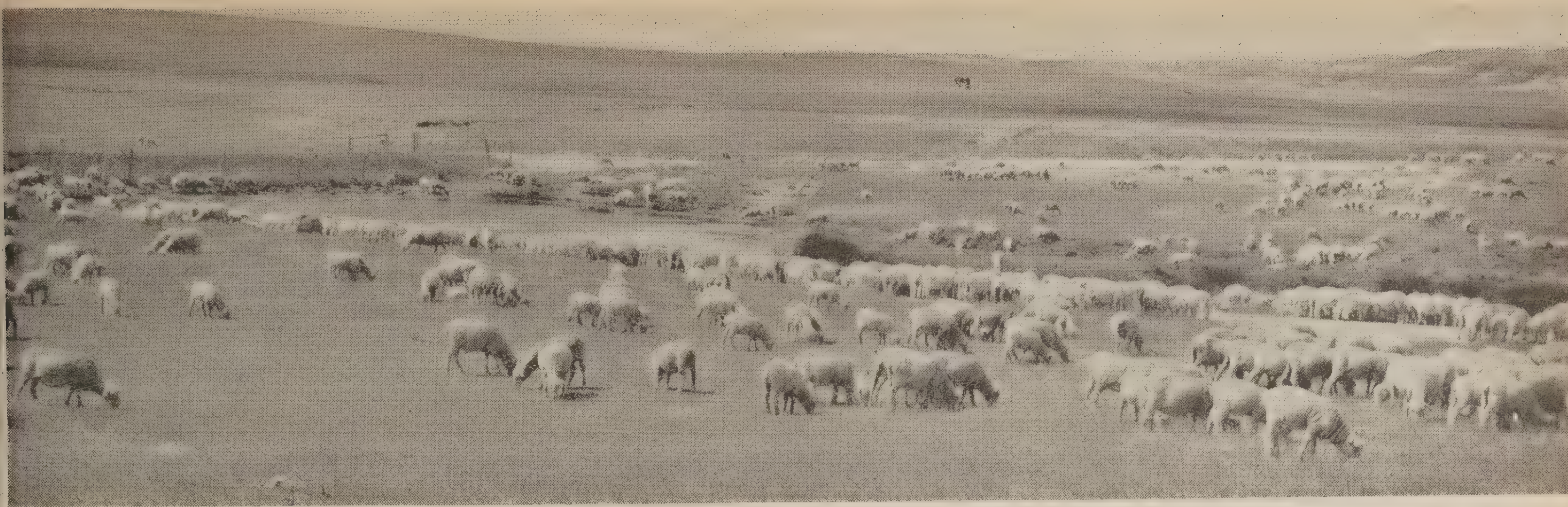
The experience of A. M. Kester near Buffalo, Wyo., gives an indication of what these practices can mean in terms of pasture yields. He spread runoff from adjoining land across part of his 480-acre pasture and built contour furrows on the rest. Kester said that last year this pasture supported 52 animal units—a cow and a calf, or their equivalent, per unit—throughout the seven-month grazing season from May 1 to December 8. This is a little more than 9 acres per animal unit, which is about one-third of the acreage of range land ordinarily required.

Hugh Errington near Goodland, Kan., a cooperator with the Sherman County Soil Conservation District, first contour-furrowed part of his grama-buffalo grass pasture in 1937, then "grooved" part of it. ("Grooves" are very narrow furrows.)

"There is a lot more grass—the grass just gets bigger for a stretch 3 or 4 feet from the grooves," Errington said.

The furrows and grooving increase forage production even in good years such as 1944, Errington explained, fully 25 percent.

And remember, this practice is only beginning to be appreciated and its proper place determined.



Properly located watering places are extremely important to the range. They help to bring about proper distribution of livestock, resulting in uniform utilization of forage instead of severe overgrazing.

Water-spreading, for the most part, is being devoted to haylands. There, the additional water is being used both to increase yields of native hay and to make possible the raising of improved mixtures of tame grasses and legumes.

Fred Hesse near Buffalo, Wyo., spreads spring and summer runoff across 400 acres of hayland. His feed production improved appreciably, and he has reserve feed.

"It once was difficult to winter 1800 head of sheep," Hesse remarked, "but now I could winter 5000 head. I also have been able to store up a good quantity of reserve feed."

Hesse reports that his conservation ranching, together with careful management and culling of his sheep, as resulted in more than 50 percent increase in meat production and 75 percent increase in wood production. This is partly because he has a few more ewes, partly because better feed and water have helped to reduce the death loss from 12 to 2 percent, and partly because better feed and water have raised the average weight of lambs from 60 to 70 pounds.

Nearly all of the rotation grazing in the Northern Great Plains has resulted from the rehabilitation of abandoned cultivated lands, although a few ranchers are beginning to cross-fence lands so that they can rotate the use of pastures. This feature of range management, ordinarily the last to be put into practice, is just about as important as the provision of necessary watering places; actually, the watering places are needed to make rotation grazing practical.

In rehabilitating abandoned, cultivated lands, more than 371 thousand acres of privately-owned lands in the Northern Great Plains soil conservation districts now have been seeded to grass, mostly crested wheatgrass. In the land utilization projects more than 463 thousand acres have been seeded, practically all to crested wheatgrass. There are still 11 million acres of farm land that ought to be reseeded.

Since crested wheatgrass is ready for use well before the better known native grass, with the exception of western wheatgrass, and has a very high grazing capacity during the early months of the year, ranchers are seeing the benefits of using it in the spring months and deferring use of the native grasses until they have made good growth. In the fall, after rains, it resumes growth following a hot-weather dormant period.

Seeding crested wheatgrass, and as yet to a lesser extent bromegrass, Russian wild rye, and a few others, therefore, serves several useful purposes. It helps to bring land back into production, increases the ability of the native range lands to produce, reduces the winter feeding period, facilitates early spring calving or lambing, and furnishes hay for winter and reserve feed.

The experience of ranchers generally is that crested wheatgrass during its best grazing period, from around April 1 to approximately June 15, has a grazing capacity up to 3 or 4 times that of native grasses. The average capacity is conservatively estimated at not more than 1½ acres per month per cow. Thus, the rehabilitated land can furnish a month's feed for about 650 thousand cows.

P. A. Beveridge, near Redstone, Mont., a cooperator with the Reserve Soil Conservation District, reports that his spring losses have been much less since he has had crested wheatgrass pasture for calving. Walter Risen, near Malta, Mont., a cooperator with the North Phillip Grazing Association, says that his ewes on crested wheatgrass pasture at lambing time take care of twin lambs without trouble. The start his lambs get before

Water-spreading has increased greatly the grazing capacity of this native range land. Extra water is provided by diverting flood flow from a stream.

they go to summer pasture results in larger lambs than he used to have at market time.

George Tillman, also near Malta, another cooperator with the North Phillips Grazing District, commented particularly on the saving in feed. By starting growth about three weeks earlier than the naitve grasses in that area, crested wheatgrass makes an appreciable difference in feeding costs and labor. The normal winter feeding period is about 100 days, and three weeks knocked off that results in quite a saving.

George McFarland, near Rapid City, S. D., a cooperator with the Elm Creek Soil Conservation District, is one of the livestock growers who has cross-fenced his land to control grazing. He has learned that in average years this pays dividends in the form of greater grass production. The grass grows better when it is given rest periods.

Probably not strictly a part of range management, but having a pronounced effect on it, are the measures to increase the production of feed for winter use and to accumulate reserves for use during dry periods. Winter feed production is necessary even in areas where wintering of livestock on grasslands is common, and is even more important elsewhere. When feed supplies are available to meet emergency demands, it is unnecessary to abuse grasslands and thus upset the range management schedule.

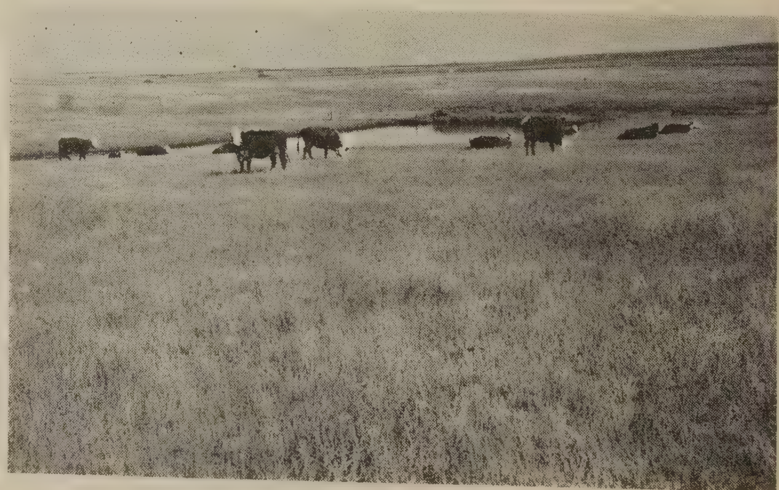
Water spreading, mentioned previously, is something to be developed over a large part of the Northern Great Plains. Improvement in the irrigated haylands in the ranch country is only now getting under way. The greatest sources of feed reserves, however, must come through the production of dryland native hay. There the moisture supply is most uncertain from year to year and the ranchers are being encouraged to cut extra hay in the good periods and hold it in reserve for the dry periods.

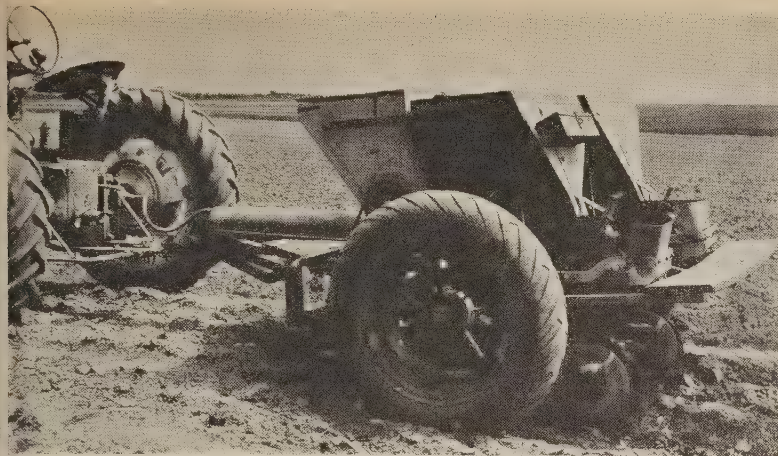
Olaf Polson, north of Kemmerer, Wyo., a cooperator with the Cokeville-Hamsfork Soil Conservation District, is one rancher who learned that improved iirrigation practices plus seeding an alfalfa-tame grass mixture yields two tons of hay per acre compared with less than a ton per acre previously obtained from his irrigated native grasslands. He is in territory where dryland hay production is almost non-existent. Aided by district technicians, he is now rehabilitating a good share of his haylands in order to produce the feed needed to stabilize his operations.

All of these things go to make up range management, or have a pronounced effect on it, and the problems and opportunities vary from ranch to ranch. After balancing livestock numbers with existing forage supplies, much depends upon the opportunities for water-spreading, irrigation, development of watering places, and so on, for each individual unit.

(*Continued on page* 206)

Some of the western range land in central South Dakota, where range management is pointed at keeping the range in good shape, now that it has recovered from the beating it took during the drought years of the '30's.





An improved 2-row potato planter which can be used on slopes up to 20 per cent and requires only one man to operate.

This new type potato sprayer applies the spray from the ground level upward, as well as from above, making possible complete coverage of plants.

RECENT RESEARCH IMPROVES POTATO MACHINERY

By JOHN W. SLOSSER

Potato growing machinery that is more efficient wherever it is operated and that can also be used with ease on hillside fields where contouring, terracing and other cross-the-slope soil and moisture conservation practices are in effect, has been developed as a result of recent research conducted jointly by the Soil Conservation Service, the Maine Agricultural Experiment Station and the University of Maine. Up to now potato growers who have adopted soil conservation measures have sometimes experienced difficulty when using machinery intended for conventional farming methods, with rectangular fields laid out in straight rows.

Four types of heavy potato machinery have been the subject of research—the planter, the multiple-row sprayer, the tillage tools and the digger. It has been the aim of the research men to develop machinery which will not only do a better and more economical job, under all conditions of potato growing, but which will cost no more than the conventional machinery. In fact, in the case of the planter, the standard-type machine can be converted at a cost of $50, and the work done by a local blacksmith or mechanic. The new planter can be operated satisfactorily across slopes up to 20 percent, and requires only one man to operate instead of the two needed for the planter now in general use. Because all soil-working parts of the planter are controlled by the soil surface, depth or spacing control is automatic. Fertilizer and seed are distributed very accurately, and seed-piece burn is eliminated.

Editor's Note.—The author is project supervisor, Soil Conservation Service, Presque Isle, Maine.

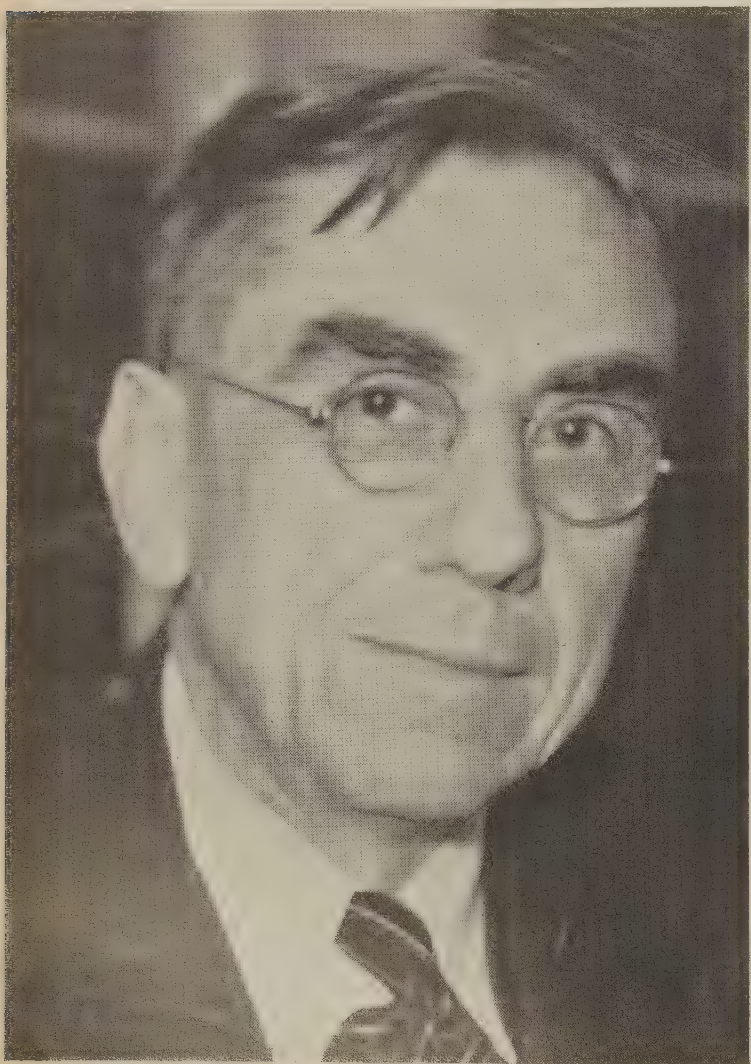
The improved potato digger in action on an 18 per cent slope.

The multiple-row sprayer has been redesigned to provide complete coverage of all parts of the plants in a single trip. The old-type sprayer frequently required two trips round the field, and even then did not always get the spray material on the stems and under parts. The improved cover-

age is accomplished by applying the spray from the ground level upward, as well as from above. The efficient coverage may save enough in spray material and labor cost in a single season to pay for the new-type sprayer boom, which is slightly more costly than the conventional boom. The sprayer also operates under a lower pressure than usual, with consequent less wear and tear on pump and equipment. So far it has been developed to handle five rows. A seven-row boom is anticipated.

The tillage tools and the digger have also been improved so as to work satisfactorily on the contour and across the slope. The standard-type digger has been rebuilt so that on a steep side slope or on soil conservation terraces the machine will operate parallel to the ground surface while the elevator operates in a horizontal plane. In that way the potatoes are delivered gently and undamaged at the rear of the digger. Leveling is easily controlled and other operations are automatic, so that the operator is relieved of having to make the important depth-control settings.

Those who have helped to develop this improved potato machinery believe that research and improvements in farm machinery of various types will speed the spread of soil conservation practices throughout the country by making them easy to apply, even under the difficult conditions sometimes encountered in specialized farming.



J. Phil Campbell

PASSING OF J. PHIL CAMPBELL

In the death of J. Phil Campbell, Assistant Chief, on December 11 at Athens, Ga., the Soil Conservation Service lost a valued worker, friend and counsellor.

Mr. Campbell had been working directly with the Service since 1935, largely with the soil conservation district movement and in relationships with other agencies.

Early in life Mr. Campbell dedicated his services to the improvement of rural life. He became a teacher at the age of 17 in a country school which was the first agricultural high school in the State of Georgia. Entering Farmers Cooperative Demonstration Work (forerunner of the present Extension Service) as state agent for South Carolina in 1907, he served successfully as regional supervisor of Farmers' Cooperative Demonstration Work for the southeastern States—the first position of the kind in the Nation, as State Agent and head of cooperative extension work between the Georgia State College of Agriculture and the United States Department of Agriculture from 1910 until 1915, and as Georgia's Director of Extension until 1934, when he was called to the Washington Office of the AAA. In the Agricultural Adjustment Administration he was in charge of planning programs for using land removed from production of cotton and tobacco, of landlord-tenant relationships under AAA contracts, and of cooperative program of Agricultural rehabilitation and WPA rural projects.

Mr. Campbell's work served to enrich rural life, and left lasting imprints on the entire soil conservation movement. —T. L. Gaston

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Our Canadian friends are expanding their work in soil conservation, as evidenced by the Conference on Conservation February 1 and 2, Kingston, Ont. This is the second conservation conference sponsored by the new Ontario Department of Planning and Development. Principal address was by Dr. Edward H. Graham, biology chief of Soil Conservation Service, "The Role of Living Things in the Care and Use of the Land."

When accompanied by appropriate conservation measures on the watershed, streambank revegetation is a highly desirable erosion-control practice. More needs to be known of its biological values.

FRONTIERS IN LAND USE BIOLOGY

By EDWARD H. GRAHAM

Farmers and ranchers throughout the Nation are applying soil and water conservation practices to cropland, range and pasture land, woodland, and land adapted best to the production of wild crops. They are doing this on more than 650 million acres of land in nearly 1200 soil conservation districts. In establishing such practices they are attempting to make use of all appropriate scientific and technical knowledge. Much of the knowledge that is proving useful is gleaned from studies and experiments not originally intended to solve specific land use problems. Hence, it is often fragmentary, partially adaptable to the practical problems at hand, or useful only as a result of patching together diverse and distantly related bits of information. In almost every phase of land management, there is a growing need for scientific information directed at the solution of particular land problems. This is especially true in the field of land-use biology.

As a result of research studies of the Soil Conservation Service, the State agricultural experiment stations, and other agencies, the erosion-control effectiveness of many conservation measures is already known. Thus, the soil-conserving values of strip cropping, terracing, cover crops, sub-surface tillage, stubble mulching and similar practices are fairly well understood. We also know that field-border plantings, hedges, pond management for fish, streambank revegetation, marsh management and other comparable measures not only are good for the land but profitable to the farmer. Numerous observations indicate that soil conservation measures increase wildlife. The effects of land-use practices upon populations are not yet fully understood, however. Much appropriate information has already been accumulated, and numerous useful studies are now under way, but it must be recognized that comparatively little research has yet been inaugurated in this important phase of land management. The best possible use is being made of the knowledge that is now

EDITOR'S NOTE.—The author is chief, biology division, Washington, D. C. This article is based upon material presented to the Ecological Society of America, September 1944.

available, but the more we learn about the biological aspects of soil and water conservation, the more effectively we are able to use all the facilities directed at the attainment of the total conservation job.

The biological work of the Soil Conservation Service is to assist farmers and ranchers in the application of sound land management practices. The work is part of an operations or actions program, and is based upon fundamental data obtained from the research of the Service and other Federal, State, and private sources. This article is presented in the hope that it may, in very general terms, suggest to colleges and universities, agricultural experiment stations, other governmental and private groups, agencies, and individuals, studies in the biological aspects of soil and water conservation and land use.

Management of farm ponds for fish production. Many applicable facts with respect to pond management have been learned, notably by the Alabama Agricultural Experiment Station, which recommends stocking a pond with 100 large-mouth black bass and 1500 bluegill bream fingerlings per surface acre and fertilizing the pond with commercial fertilizer. In the Southeast it is now possible to produce 250 pounds or more of palatable food fish annually per surface acre of pond—a meat yield comparable to that from our best pastures. Thousands of ponds are already producing fish—hundreds of thousands are likely to be stocked in the future. We still lack sufficient knowledge of the ecology of warm-water ponds, however, to determine satisfactory stocking rates,

Lespedeza bicolor against the trees, _L. sericea_ next to the crop. Field border plantings control erosion and have many other values but their exact influence on populations of insects, birds and mammals is not fully understood.

species of fish, and kinds of fertilizer for cold northern ponds and ponds of the western states, where waters are highly alkaline and pond water levels fluctuate greatly throughout the year.

Even in the Southeast, if the value of organic fertilizers (manure, hay, compost, offal, and seed meals) were better understood, and their use developed, it might be possible to reduce the cost of pond fish management and render it more readily accomplished on the average farm and ranch. Also, can trout waters be profitably fertilized? Only a handful of studies have been conducted on this subject. Management features are needed which render ponds, as well as sedimentation areas and settling basins above ponds, less suitable for mosquitoes, especially in malarial areas.

Marsh Management for muskrat production. Marsh land is often as productive, acre for acre and dollar for dollar, as any land on the farm. The coastal marshes of Louisiana yield up to 6 million muskrats per year, while the inland marshes of Minnesota yearly produce enough muskrat pelts to be worth between one and two million dollars. About two million acres of marshland—nearly one-third the total in the United States—are on farms and ranches, and it is believed that yields from these areas could be increased by specific land treatment. Although a great deal is known about marshes and muskrats, practical schemes for modifying marshlands to improve them as muskrat habitats have not been thoroughly explored. Further investigations are needed to throw additional light on such matters as (1) effects of ditching on muskrat populations; (2) methods of controlled burning in marshes, and their influence upon vegetation and muskrat numbers; (3) effects of various controlled water levels upon marsh vegetation; and (4) guides to rapid determination of muskrat numbers.

Streamside Ecology. During the past decade streambank erosion control by the use of vegetation has been accomplished in various places, particularly in the Northwest, Southwest, upper Mississippi Valley States, and the Northeast. We already know, that where it is supplemented with a watershed program for soil and water conservation, streambank control by vegetative means is a desirable practice on small streams. If we are to undertake any extensive program of restoring eroded streambanks to a protective cover of useful vegetation, however, additional facts should be at hand. If a grazed streambank is protected from livestock, what particular type of vegetation is likely to result along the stream in a given region or area? What are the common insects, birds, and

Our knowledge of the effect of hedges on harmful and beneficial insects, birds and mammals is still inadequate. A contour hedge of *Rosa multiflora* does check soil loss and provide a living fence that turns livestock.

mammals which will inhabit such streamside vegetation? What plant species are best for controlling streambank erosion? What management measures will be required to maintain vegetation proved desirable for streambank control? These and other questions must be answered before vegetative means of streambank work can be guaranteed.

Streambank revegetation promises to assume the magnitude, in some states, at least, of community or public projects comparable in scope to the building, landscaping, and maintenance of public highways. An analysis of conservation needs conducted by the Soil Conservation Service shows nearly 1,000,000 acres of streambank erosion control to be necessary on farm and ranch lands. To make such projects more successful, it would seem, a great deal more needs to be known of the ecologic, as well as the hydrologic, behavior of streams and streamside habitats.

Hedge Management. The use of shrubs of low growth form for hedges, that will not spread into adjacent areas and that require little maintenance, promises to become widespread in some regions. As part of a national program of soil and water conservation on agricultural land, it is estimated that more than 500,000 miles of hedges are needed. Hedges are being established on the contour between crop and pasture fields, above vegetated diversion terraces, and to mark divisions between large fields. Although the values of hedge as an erosion-control and land-use measure are recognized, we still lack sufficient knowledge of the kinds and numbers of insects, birds, and mammals hedges support, particularly the relationship of these animals to crops grown in areas adjacent to hedges. Do hedges materially influence numbers of game birds and mammals, and if so, what game species can hedges be depended upon to benefit? Only a few studies have so far been conducted on this subject.

We also need experimental evidence to designate those species of plants that are most desirable for hedges grown under field (not garden) conditions, and which of them can be grown by seeding them on site, thus facilitating their establishment and obviating the cost of using nursery-grown stock. Recent experiments with Rosa multiflora have proved it to form a good living fence capable of turning livestock under field conditions. We need to know of other shrubs that can be substituted for fences when grown as hedges, and how to establish and maintain them with a minimum of care and expense.

Field Border Ecology. Throughout many of the eastern and southern states it is becoming a common erosion-control practice to establish shrubs on woodland margins, and, on the unproductive edges of crop field where they adjoin woodlots, to plant shrubs and other selected perennials, including a few introduced lespedezas (*L. sericea, L. bicolor, L. cyrtobotrya*). The establishment of useful vegetation on field borders, where erosion is often a serious problem, is frequently a necessary part of a complete farm plan. Some 50,000 acres of field border plantings have already been made by farmers, and it is estimated that 3,000,000 acres of such borders required the establishment of appropriate vegetative cover. There are questions yet unanswered about this practice, however. There are practical needs with respect to the use of the plants themselves—species most appropriate, best time and rate of seeding, selection of desirable strains—although many of these things are being learned through the experience of technicians and farmers who are using the plants. What is not being learned through practical experience is something of the ecology of these borders, which present a typical problem in "hedge effect." What is their influence upon animal populations? Are they of unqualified benefit to useful species (e.g. bobwhite, mourning dove, cottontails, bees), or do they materially increase undesirable species (e.g. cotton rat)? In brief, we require for field borders the same kind of knowledge needed about every particular land management device, practice, or measure being recommended for soil and water conservation and good land use—what is its biological effect?

Management of Spoilbanks. Where valuable coal deposits are near the surface, steam shovels

are often employed to expose them, the earth being overturned and laid aside. In many states, particularly throughout the Ohio Valley, strip-mined areas are a common sight. Numerous studies have been made of the plant succession that occurs on such areas, and plantings of various trees and shrubs have been made on them. It is estimated that there are approximately 250,000 acres of spoilbanks of various types in the United States needing some kind of treatment to make them once again productive land. But comparatively little attention has been directed to the determination of the most desirable types of revegetation to be undertaken on strip-mined areas, on ra wbanks of drainage and irrigation ditches, and on like sub-soil areas. Ecological facts, based upon a knowledge of biotic communities that succeed each other on such sites, might well suggest the best types of plantings consistent with the natural development of vegetation upon them. Should they be reforested, converted to pasture, or only protected from fire and grazing in order to permit natural revegetation for whatever wildlife and recreational areas they will in time provide?

Insect Problems. Damage to crops from injurious insects in the United States is known to amount to three billion dollars yearly. Whether this damage is likely to be increased or decreased by the adoption of land-use practices intended to control erosion is not yet fully known. There is a great deal of ecological work necessary to provide land managers with the entomological knowledge they need in order to successfully establish and maintain soil conservation practices. In brief, the question usually is: Will the adoption of a given practice, applied to control soil erosion, result in a change of insect populations, and if so, will the change be beneficial or harmful? Some of the conservation practices which very likely influence insect populations (and for that matter, birds and mammals also) and which should be studied from this viewpoint are:

- Strip cropping
- Crop rotations
- Cover crops in cultivated fields and orchards
- Hedges
- Field border plantings
- Farm ponds (especially designed with respect to mosquito control)
- Use of special erosion-control plants (e.g. kudzu with respect to white-fringed beetle)
- Stubble-mulching (crop residue on stubble left on fields for erosion control, especially in semi-arid plains)
- Sub-surface tillage (e.g. effect on grasshopper numbers)

Rodent Problems. The funds normally spent each year in the control of wild rodents believed to be harmful to the growth of crops, range vegetation, and forests, amount to several million dollars. Notwithstanding the considerable expenditure for rodent control, and many special studies on rodent life histories and habits, our knowledge of rodents as they relate to land use is far from adequate. Under what conditions is it both economically and biologically sound to reduce rodent numbers, and what land management recommendations should accompany such reduction to assure it a measure of permanence? One of the chief needs is a knowledge of the effect of livestock grazing upon rodent populations. We need to know more about the environmental effect of the reduction of a wild mammal species, especially in range areas, where not much is yet understood of the effect of rodent control upon range vegetation.

We still do not know enough about the results of standard poisoning methods, e.g. the percentage of the population of various rodent species destroyed, how long it takes survivors to build back to normal numbers, and how rapidly various species move into a poisoned area from outside. We need to know also the effects of rodents, e.g. kangaroo rats, pocket mice, ground squirrels, and prairie dogs, upon range reseeding. Their influence upon rangeland succession should be better known, and so should the relationship of rodents to climax types of vegetation. Numbers of rodents and their effect upon orchards managed with cover crops to control erosion should be further investigated. Finally, the influence of burrowing rodents upon erosion and infiltration of rainfall, and their effect upon soil condition are all too imperfectly understood, although what is already known indicates their value may be as great as that of earthworms.

Noxious Plant Problems. That weeds are often abundant as a result of land use is common knowledge, and much has been learned about how to control weeds, which cause damage to agriculture in excess of that caused by harmful insects. Weed control as a result of cultural practices has re-

ceived far less attention, however, than control by direct, aggressive means, such as burning, cutting, or use of chemical sprays. Yet good land management may be the most permanent and least costly kind of weed control. The effects of various recommended soil and water conservation measures upon weed species should be more thoroughly understood, especially the occurrence of weeds in crop fields, pastures, and range lands with reference to kind and intensity of use. To date the methods most widely employed for the control of mesquite, cedar, cactus, and many other noxious perennial plants, are aggressive ones. There is still considerable uncertainty concerning the extent to which the spread of such plants is due to past and present land use, and what types of land management should accompany their control if it is to be assured any reasonable degree of permanence.

Effects of Erosion on Plant and Animal Communities. Although the changes caused by erosion may at first seem obvious enough, resulting so often in denudation of land, such changes are not very well understood with respect to their effects upon plant and animal life. Even if erosion does not denude a habitat, it results in material environmental change. Sheet erosion alone causes a marked variation or destruction of upper horizons of soil profiles. It also changes soil fauna and flora and modifies the surface communities of plants and animals. But what is the nature of such changes, and how do they relate to land uses? We might well profit, in a very practical sense, by knowing more about the ecological behavior of living things, as it relates to accelerated soil erosion.

One of the great unknowns in this field is the effect of erosion upon water animals and aquatic habitats. There is reason to believe that sedimentation of streams, ponds, and lakes strongly modifies water environments, to the extent that useful aquatic life—fish, mussels, oysters, etc.—as well as general public use of water, is very seriously affected. Yet the studies on this subject are as yet very few.

The effects of man-induced soil erosion upon living communities, as well as the relationship of wild plants and animals to land-use practices employed to achieve soil and water conservation, form a subject of both academic and practical significance. Those who will undertake to study it can render a highly useful public service and at the same time contribute to fundamental knowledge in the field of applied ecology.

Added Income from Christmas Trees

Trimming the ends of Christmas trees after they are cut with an ax. This is a part of the harvesting job.

By ELMER C. LOY

The harvest of last season's Christmas trees brought some $553,000 to Flathead and Lincoln Counties in northwestern Montana where, although a specialty crop, it has become a major industry.

For some, it meant extra money for Christmas presents or war bonds; for others, it meant stretching farm income so that all expenses could be met. On the basis of the last census figure of 2,235 farms in the two counties, the average returns from Christmas trees was slightly under $250.

Just short of 2½ million Christmas trees were harvested in the two counties. These amounted to 503 carloads, of which all but a dozen were shipped by rail. The others were trucked to cities for sale.

A little over $385,000 went into payment to the producer for cutting and hauling. The producer paid his cutters, as well as stumpage prices to the owner if he cut on other than his own land, and either hauled the trees to the shipping point or hired it done. The remainder, nearly $165,000,

EDITOR'S NOTE.—The author is farm forester, Soil Conservation Service, Lincoln, Neb.

went to local labor for grading, tagging, bundling and loading.

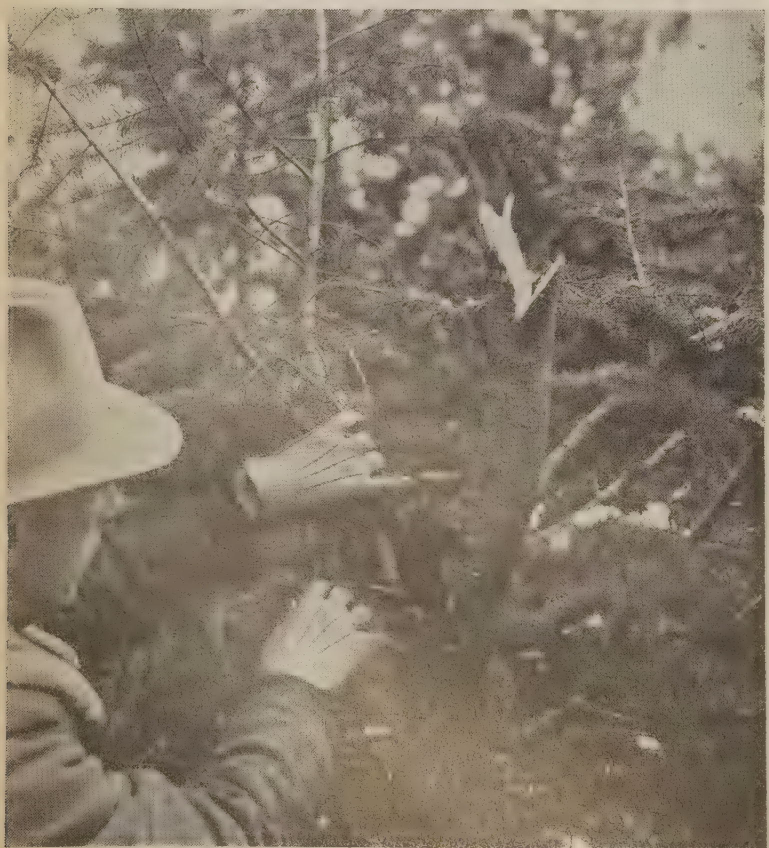
Larger producers employed extra labor, but the smaller ones did their own work, receiving both the payment for the trees and the earnings for getting them to the shipping points. This averaged about 15½ cents per tree delivered to the cars. Other work at the shipping points cost the shipper about 6½ cents per tree.

The Christmas tree harvest does not compete with war activities. Coming at a time when field work on the farms is buttoned up, this harvest draws principally on farmers and women of the community for labor. The past season, women were employed for some of the cutting. The freight cars occupied would undoubtedly have been empty on the eastward journey, since in this section the heavy traffic is westbound.

Virtually all of the trees, except those trucked out by individuals to cities for sale, are contracted by some of the several firms active in the Pacific Northwest. During the harvest season they establish receiving yards at shipping points.

The largest share of the trees came from farms which are largely timber-covered, and many of whose operators have always depended on woodswork for part of their incomes. Many came from National forest lands, where they are cut according to specifications designed to leave the remaining trees freers to develop high-quality wood products.

By careful cutting, one tree can be made to furnish several Christmas trees. The hand here points to the place from which the first tree was cut a few years ago. At right are remains of the branch which grew into the second Christmas tree. At left is another branch which will develop into a Christmas tree in a few years.



In an effort to develop the Christmas tree industry as a permanent thing—part of the best use of privately-owned forest lands—the Soil Conservation Service has been assisting farmers in establishing a system of forest farming.

This assistance came through the farm forestry demonstration project at Kalispell, Mont., cooperation with private operators, and assistance to the Tobacco Valley Soil Conservation District's cooperators in northeastern Lincoln County.

How to select trees for cutting, how to thin stands for greater production of Christmas trees on a continuous basis, how to leave branches that will develop into Christmas trees, and how to grade and care for them, are some of the things demonstrated to the farmers, more of whom are adopting the improved practices each year with a view to sustained annual yields.

Although most widely known, the Christmas trees industry is only part of a farm forestry business which the technicians are helping the operators develop.

Northwestern Montana is predominantly a timber country, with the amount of farmland limited and many units insufficient in size to be supported by cultivated crops alone.

Most units, on the other hand, have enough timberland to make them self-sustaining if the timber resources are developed and handled properly. The products include fenceposts, poles, fuel wood and sawtimber, and, of course, Christmas trees. Growing and harvesting of these products also furnish winter employment.

The Soil Conservation Service and the soil conservation district to date have concentrated on helping farmers set up marketing groups and also on showing them how to clean up their stands for greater production of high-grade products. The demand for pulpwood during the war stimulated this process.

Christmas trees, however, have been in the forefront largely because the ready market was there in the form of contractors, and the trees represented a ready cash crop. To a large extent they were regarded as something extra from the land, and cutting was indiscriminate, except on the National forest lands.

Present developments have progressed to the point where a larger proportion of Christmas trees are cut according to recognized sustained-yield practices.

NATIONAL 4-H AWARDS IN SOIL CONSERVATION

Winners of $200 college scholarships in National 4-H Club Soil Conservation Contest. Top row, left to right: Samuel Burkhart, Jr. 18, Washington, Ind.; Alfred Neumann, 18, Bigfoot, Tex.; Ray H. Crosby, 18, Mohawk, Tenn.; Earl Brown, 20, Dwight, Kan.; John A. McGee, 15, Okemah, Okla. Bottom row, left to right: John L. Murphy, Jr., 20, Mt. Sterling, Ky.; H. Orell Haagenstad, 19, New England, N. D.; Robert Schwartau, 20, Goodhue, Minn.

By WALTER W. JOHN

For the first time in the history of 4-H club-work, national awards for achievements in soil conservation were made at the 23rd National 4-H Club Congress, which met in Chicago December 3-6. Sixteen boys from as many states won free trips to the Congress, and 8 of them were given additional prizes of $200 college scholarships. The Extension Service and State Agricultural Colleges sponsored the Nation-wide soil conservation contest and all awards were provided by the Firestone Tire and Rubber Company.

Winners were Samuel Burkhart, Jr., Daviess County, Ind.; Earl Brown, Geary County, Kan.; John L. Murphy, Jr., Montgomery County, Ky.; Robert W. Schwartau, Goodhue County, Minn.; H. Orell Haagenstad, Slope County, N. D.; John Arlen McGee, Seminole County, Okla.; Ray Harry Crosby, Greene County, Tenn.; and Alfred Neumann, Frio County, Tex.

The other 8 state winners, who attended the Congress as the guests of Firestone were Willard L. Robinson, Jr., New Castle County, Del.; Clifford W. Holloway, Jr., Harford County, Md.; Alfred W. McKinstry, Hampden County, Mass.; Russell G. Mawby, Kent County, Mich.; Howard Calkins, Bernalillo County, N. M.; Wayne Stoutenburg, Union County, S. D.; Donald C. Jensen, Chippewa County, Wis.; and Lyle Wilson, Campbell County, Wyo.

In announcing the scholarship winners at the annual banquet, Jess Cune, who takes the part of Scattergood Baines in a well-known radio serial, referred to the soil conservation contest as "the newest and probably the most important of the 4-H Club projects because we recognize that the soil is the source of all our agricultural production." Russell Firestone personally presented the scholarships. Although there were no girls among the national winners, some were entered in the county and state contests.

Entries were submitted from 325 counties in 28 states. It is planned to repeat the contest next year, possibly with some revisions in suggested activities.

Significantly, 6 of the 8 scholarship winners live on farms in soil conservation districts, and most of them reported having worked out farm

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EDITOR'S NOTE.—The author is head, regional section of education, Soil Conservation Service, Milwaukee, Wis.

plans with the district supervisors and Soil Conservation technicians. Some even helped organize districts. Eighteen-year-old Alfred Neumann reported that he and his brother presented a soil and water conservation demonstration for farmers at every schoolhouse in that part of his county which was being considered for a district. And he added, "that part of the district was organized without a dissenting vote."

The influence of son on father in obtaining application of soil conservation practices was also apparent. Concerning the report submitted by Robert Schwartau of Minnesota, County Agent G. J. Kunau wrote, "Through his interest in soil conservation, has influenced his father to develop a complete foreign conservation plan in cooperation with the East Goodhue Soil Conservation District."

John L. Murphy, Jr., the Kentucky boy, said, "I think I have sold my father on contour rows because he plans to buy a farm level."

Wakelin McNeel, state 4-H Club leader in Wisconsin, and popularly known as "Ranger Mac," described the soil conservation contest as a "culmination of the great interest in this subject and an award to a few who have done the best work with their projects. The award is not the important thing, though," he pointed out. "The greatest value in these projects is the development in youth of a proper attitude toward soil and the experience that 4-H Club boys and girls obtain in conservation."

One of the outstanding records of accomplishments in the contest is that of Earl Brown of Geary County, Kan. Here is the list of soil conservation projects he completed in the last three years on his father's 267-acre farm and 182 other acres they operate:

1. Built 6 miles of terraces (3 by grader and 3 by plow).
2. Made an outlet channel and sodded it.
3. Maintained terraces by backfurrowing them each year.
4. Farmed all terraced land on the contour.
5. Had an activated booth at the Kansas State Fair showing how to build terraces with a plow.
6. Made a diversion ditch.
7. Built a 2-acre pond and stocked it with fish.
8. Provided food and cover for wildlife.
9. Planted 149 acres of clover and 97 acres of alfalfa.
10. Fenced 19½ acres of woodland.
11. Hauled all manure out on the land.
12. Used phosphate on wheat and alfalfa.
13. Clipped weeds on permanent pasture.
14. Talked on soil conservation at local club meetings.

"Our plow terraces were among the first in Geary County and in Kansas," Earl said. "L. A. Jacobson, soil conservationist, brought dozens of farmers to see them. All liked the terraces and found it easy to understand how to build them. Building terraces with a plow is now the accepted method among our farmers on fields where the slope is not more than 5 percent."

Earl suggested that his county have a plow terrace exhibit at the state fair, so the county agent gave him the job of building and tending it.

Samuel Burkhart, Jr., has worked out a complete soil conservation program for the 160-acre farm his father purchased in Daviess County, Ind., two years ago. With the guidance of district supervisors and District Conservationist Ward Studor, he has built nearly a mile of terraces, laid out contour lines, rearranged fences to facilitate contouring, built a stock pond, and opened up drainage ditches.

"Our ultimate goal," Sam reported, "is to have all fields limed, fertilizer applied in the right amounts, all fields growing good legumes, a good crop rotation established, all fields cultivated correctly (on the contour), all terraces completed, the farm completely fenced, a good supply of pasture, a woodland for posts, and a farm stock pond."

Sam established himself as a soil conservation salesman at a Friends of the Land meeting in Chicago November 27. Speaking the language of a true son of the soil, the red-haired Indiana boy convinced the 150 leading industrialists and professional men and women attending the meeting that conservation farming is a "must." He told them how that farming should be done, too.

Ray H. Crosby made his own farm level and used it to lay out contour lines on his father's 218-acre general livestock farm in Greene County, Tenn. He carefully analyzed the fertility needs of their soil and is following a systematic program of fertilization. Seeding waterways, planting cover crops, protecting the woodlot against fire and grazing, and building gully dams are parts of his project to control erosion on the home farm.

Orell Haagenstadt of Slope County, N. D., concentrated on measures to check wind erosion on the 1,500 acres of farm and range land he and his father own. Soil Conservationists Bahr and Dietrich guided him in working out plans for strip cropping, tree shelterbelt, adapted grasses, and wildlife plantings.

Here is one means of interesting city dwellers in the new ways of farming. These murals are in the office of Kenneth E. Shepard, a Chicago advertising man. He borrowed the negatives from the Soil Conservation Service, had the views expertly enlarged and mounted on the walls, with the idea of pleasing his customers and teaching them something of soil conservation.

Youngest of the scholarship winners is John Arlen McGee, 15, Seminole County, Okla. He developed his soil conservation project around their livestock farming program. During his few years of 4-H activities, he has completed 29 livestock projects. He and his teammate won the Oklahoma 4-H demonstration championship this year with their discussion and display of soil conservation practices on a model farm.

An enthusiast for farm ponds, John had this to say for them, "A pasture is not very efficient if it does not contain a pond of some kind. If more attention were given to American farms in control of erosion and to the healthfulness of livestock, more farm ponds would be built."

Kentucky's winner in the national contest, John L. Murphy, Jr., of Montgomery County, started in his community the new practices of contour farming and seeding cover crops on tobacco land to increase production. "They kept the fields from washing away in spring and held moisture during the drought," he said. Balbo rye and vetch were the cover crops he used. He laid out the contour rows himself and built a pond dam with a bulldozer.

Alfred Neumann and his brother have been in complete charge of the family's 170-acre farm in Frio County, Tex., since their father died two years ago. They also have been farming another 100 acres to help boost food production. Their farm conservation plan, developed in cooperation with County Agent N. H. Hunt and the local soil conservation district, includes contouring, terracing, grassed waterways, rotation and deferred grazing, and a pond. They lay out their own contour and terrace lines.

The demonstration that the Neumann brothers gave in schoolhouse meetings for organization of a district had this bit of masterful presentation, "Did you ever dream of building a 'little nest somewhere in the west,' and would that nest in the west be a gully-washed, eroded hillside? Or would contoured rows and the symmetry of terraces, and growing grasses and ripening grains be your dream?"

The top winner as far as number of projects is concerned is Robert Schwartan, Goodhue County, Minn., who influenced his father to "sign up" with the soil conservation district. Robert has completed 37 projects during his 4-H career. Most of them were livestock projects, which included lambs, pigs, heifers, turkeys, and a colt. During the three years that he has been practicing soil conservation he has followed a program of contour farming, building terraces (with a plow), establishing grassed waterways, filling gullies, and improving conditions for wildlife.

One of his future projects is to eliminate the cattle lane on his father's farm. "It's a sore spot," he said. "I haul dirt back up the lane every year so we can haul crops and machinery over it." He and his father decided the highway ditch along their farm should be vegetated so they planted alfalfa and timothy on it. Their harvest from that ditch is about three loads of hay per crop.

In concluding his report to the national committee, Robert wrote, "I work with the soil almost every day in some way and, if that isn't enough to make one stop and think about all our erosion, I would like to know what is. After all, where do we make a living from on the farm, if it isn't from the soil?"

THE GREATER TASK AHEAD

By R. W. ROGERS

There is yet confronting us the tremendous task of *total* conservation. Too few people realize that the present rates of soil and water losses far exceed the annual savings brought about by established conservation practices and measures.

Considering all of the 6,096,799 farms and ranches, those practicing conservation farming as well as those not doing this kind of farming, the average annual yield per acre for 17 principal crops has increased an average of 15.2 percent per year since 1937, as compared with the 10-year average annual yield of the same crops for the period 1923 to 1932. Established conservation practices and measures, improved seed varieties, fertilizers, patriotic efforts of farmers and ranchers and other things such as generally favorable weather, have helped to bring this about. But notwithstanding our total improvements on the land there is still an average annual loss in yield per acre of about 1 percent per year for all crops during the last decade. Much of our best soil—that thin precious layer of productive topsoil—is continuing to wash downstream.

In 1944, erosion-inducing and soil-depleting crops such as corn, small grains, potatoes, etc., were harvested from approximately 40 million more acres than in 1940. Obviously, the conservation job must be intensified.

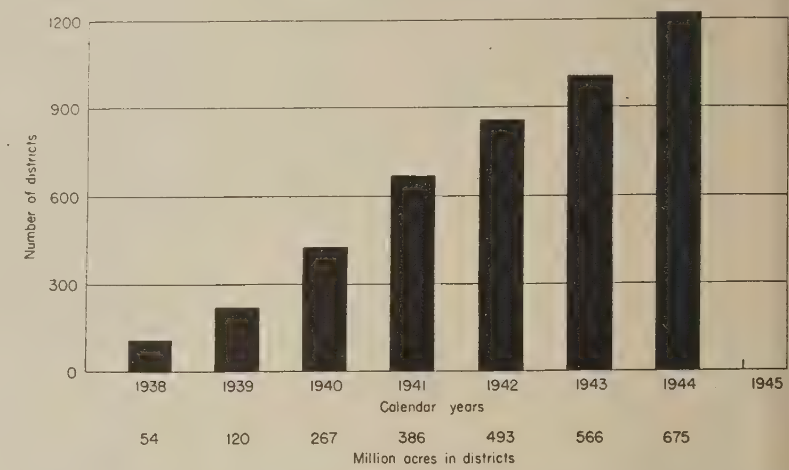
Many farmers and ranchers in 45 States have already taken the necessary steps to set up local democratic organizations to administer and coordinate the conservation job on the land. With trained leadership and technical guidance, the practices needed to control erosion and improve fertility on over a billion acres of farmland can be carried out by landowners and operators themselves.

On December 15,1944, there were 1,203 organized soil conservation districts comprising a total of 668,563,948 acres and 18 grass conservation districts containing 6,613,136 acres. There were 3,109,536 farms and ranches in these districts. The Soil Conservation Service was working with 1,087 district governing bodies.

At the present time, the Soil Conservation Service's share of the total conservation job on private lands divides into three main categories, namely: (1) planning of farms and ranches for conservation; (2) assistance in the establishment of conservation practices; and (3) guidance in maintenance of established practices and measures. There are also the programs of widespread application of simple practices, like contouring, rotations and controlled grazing, on farms not having plans; group enterprises, such as drainage; irrigation and flood control, involving many farms or an entire watershed; land management, on Federal lands administered by the Service; and research, to develop improved techniques.

NUMBER OF CONSERVATION DISTRICTS ORGANIZED

Cumulative by Calendar Years—1938-1944



During 1943, in districts, a total of 54,174 new farm and ranch conservation plans containing 17,629,318 acres were prepared by Soil Conservation Service technicians in cooperation with owners and operators, and 9,805,538 acres were treated. For 1944, it is expected that about 58,000 plans containing 18,900,000 acres will be prepared and at least 12,500,000 acres will be treated. By the end of 1944, a total of 259,501 plans in districts will have been prepared in which the owners and operators agree to go ahead with desirable land use and necessary treatment on 73,205,342 acres, and approximately 37,703,833 acres will have had the planned practices established. With the present trends in district organization and increased demands for conservation, it appears that by 1950 provisions should be made on a nation-wide basis for a conservation planning load nearly double that of 1943, and an establishment load at least three times as large.

There are many factors which affect the rates of establishment of conservation on the land and the quality of the work. In some localities, the

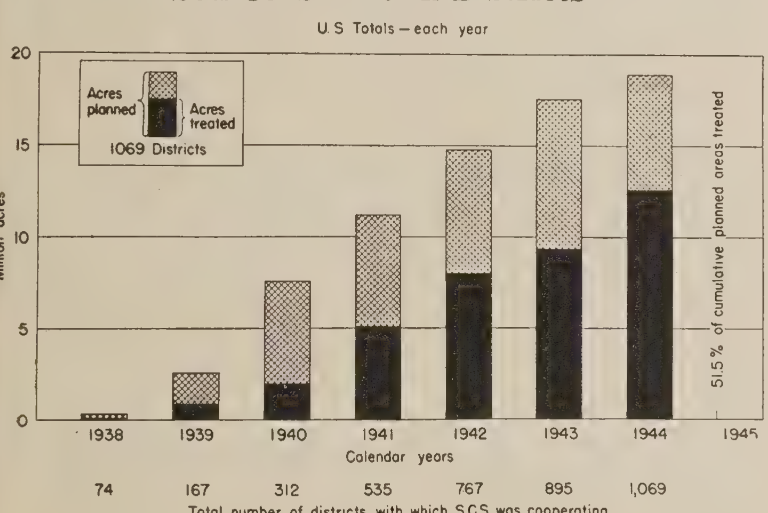
Editor's Note.—The author is chief, records and reports division, Soil Conservation Service, Washington, D. C.

rates and kind of accomplishments are affected by the attitude of local landowners and operators, their customs or habits, their degree of recognition of erosion conditions, and the like. However, after the decisions to go ahead have been made, it is the difficulty or complexity of the conservation job and the methods or techniques used that determine the amounts of work accomplished. Conditions vary, even by communities and farms; therefore, varying procedures must be used. Each segment of the task should be examined in detail, in itself and in its relation to the whole, and determinations made as to the correct procedures.

Intensification of the conservation job is a challenge to the intelligence and industry of all concerned. Farmers and ranchers should fully accept their individual responsibilities. Group action in many cases is imperative. These are necessary before conservation can be established and maintained on a substantial acreage. District governing bodies will do well to strengthen their leadership, utilizing community and neighborhood leaders wherever possible. State committees (boards or commissions) may wish to advise districts more fully with respect to priority of areas, coordination of activities, use of funds, and other available facilities. Urban folk and civic organizations having an interest in the land can be of help. Industrial manufacturers, processors, and equipment companies directly and indirectly dependent on the products of the soil, can provide equipment, material, and supplies. County, State, and Federal agencies, assisting landowners and operators through districts, can improve or in some instances increase their assistance to districts. Improved procedures and techniques should be invoked to get on more rapidly with the conservation job.

ACRES PLANNED AND ACRES TREATED

Soil Conservation Districts



Nothwithstanding American agriculture's heroic response to the war need for increased production —a response that will continue so long as the emergency exists, the fact remains that the total soil conservation job is but well begun. To insure a *permanently* productive agriculture more strenuous efforts must be exerted and the work on the land must be greatly intensified.

ACCOUNT OF STEWARDSHIP

Reporting the progress of the Washakie Soil Conservation District in central Wyoming is no mere formality with the board of supervisors. Instead, the district board of supervisors teamed up with the Farm Bureau, which sponsored organization of the district, to give a public oyster supper and dance. The soil conservation district's progress report was made to that assembly.

Frank Dunn, chairman of the board of supervisors, was spokesman. He described the work accomplished, the new lands brought into production, the savings to farmers through use of contract equipment, the value of soil surveys, better irrigation, crop and soil management, and other work with which the district and assisting Soil Conservation Service technicians help the farmers.

Dunn also discussed opportunities for further work, mentioned 4,000 acres of land under existing canals and on which water assessments are paid but which produce nothing. This is the equivalent of 20 new farms of 200 acres each. The technical help needed to reorganize irrigation systems for better farming and higher production, and the possibilities for pump irrigation of 14,000 acres above the canals came in for discussion.

He made quite a point of the fact that the work of the district and of the Soil Conservation Service in the district is governed entirely by the farmers themselves—"the only set-up" he said, "so governed without restrictions and qualifications."

Nearly 300 people attended. Their interest was aroused by a display of pictures of district work and a demonstration model of spile irrigation. The district's share of the cost of the meeting was $75.

—A. E. McClymonds.

In the tidewater soil conservation districts the Virginia Commission of Game and Inland Fisheries, working with the Soil Conservation Service, is testing land-management measures in marshlands to improve conditions for muskrats.

REED CANARY PAYS OFF ON MICHIGAN MUCKLAND

The same 4-acre field of reed canary grass carried 25 cows all last summer. Field at right had unpalatable marsh grass.

By W. L. WILLIAMS

More pasture, more hay, more seed, and even more muskrats have resulted from growing reed canary grass on muckland in the Fenton Soil Conservation District, Livingston County, Mich. On wet muck areas that cannot be drained economically (which includes nearly 8 percent of the Fenton District) reed canary grass is proving quite profitable, where before only the poor-quality marsh sedges would grow.

Lloyd Salmon, a farmer cooperating with the Fenton Soil Conservation District, says, "Before I had reed canary grass I used to rent additional pasture each summer, but now I have all I want and have extra pasture I could rent to my neighbors."

Two other district cooperators, Burton and Manfred Harris, put up 70 bales an acre from their ungrazed reed canary grass and sold it at 75 cents a bale. Walter Pazinski harvested more than 1,000 pounds of clean seed from his 5-acre planting. The increase in muskrat population was reported by Elroy Warner who attributed it to the fact that reed canary grass shoots and roots provide more and better feed than native grasses.

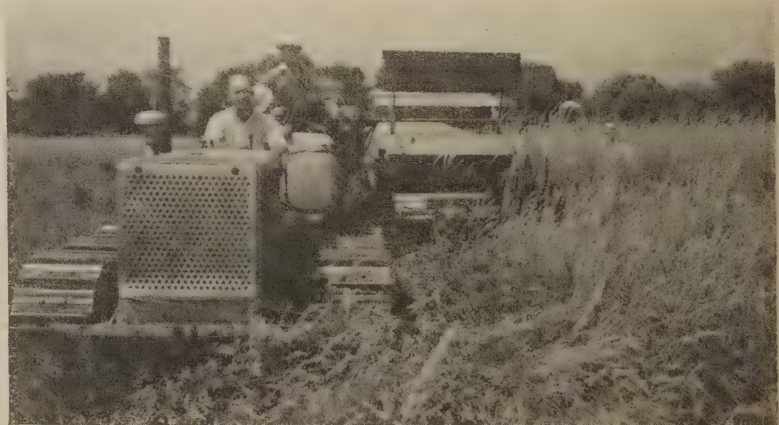
About 500 acres of marshy land have been planted to reed canary grass since it was introduced in the erosion control demonstration project there in 1938. It proved to be just the forage crop needed to supplement native bluegrass and alfalfa pastures during the late summer. A hundred farmers in this dairy section that helps supply the Detroit fluid milk market have benefited from this new summer pasture during dry periods when other grasses are at low production.

When the Fenton Soil Conservation District was organized in 1940, the directors secured a crawler-type tractor and a 22-inch marsh plow to help prepare a good seedbed for reed canary grass plantings on marsh land. This equipment was a boon to the entire program of the district because farmers were willing to try some unfamiliar soil-saving practices such as contouring, strip cropping, and terracing in order to have their marshland plowed. Thus, the whole farm was put to better use under a soil conservation plan.

Many of these marshy areas were landlocked and under water much of the year and could be plowed only when the water table became lowered in middle or late summer. Since reed canary grass thrives under wet soil conditions, it is ideally suited for such areas. Its tough, well-matted turf holds up considerable weight of grazing animals or equipment for harvesting seed or hay.

The cost of establishing reed canary grass on marshlands varies between \$15.50 to \$18.00 an acre—including \$8 to \$9 for plowing and seedbed preparation, \$2.50 to \$3.00 for seed, and \$5 to \$6 for fertilizer. Figuring that an acre will graze three or four animal units for five months at \$1.00 an animal-month, an income of \$15 to \$20 in the first year would pay the cost of establishing the grass. A stand of reed canary grass may last 20 years or more; it spreads from both seed and rootstock.

Harvesting 200 pounds of reed canary grass seed per acre on the Walter Pazinski farm, with crawler tractor and combine. Note height of grass. It was not grazed prior to cutting.



Editor's Note.—The author is farm planner, Soil Conservation Service, Fenton, Mich. *Soil Conservation* would be interested in the experiences of other regions with regard to ladino and other clovers in comparison with reed canary grass, and in having suggestions as to the grazing management of reed canary grass.

Most of the seedings have been made before September 1 because a few made in September and October were unsuccessful. The recommended rate is 6 to 8 pounds an acre with 200 to 300 pounds of fertilizer of 3-19-18 or comparable analysis. Seeding shallow and cultipacking are recommended.

Reed canary grass will stand heavy grazing. As an example, 30 head of livestock grazed 6 acres of it all last summer on the Charles Sutton farm, and there was plenty of feed left. Where the number of livestock is not sufficient to keep it down to 6 or 8 inches high, it is advisable to clip and remove a crop of hay.

Newly seeded reed canary grass pasture, at left, on farm of Lloyd Salmon. Before it was plowed in 1939 this area was similar to marsh grass field at right.

REVIEWS

THE NATURE AND PROPERTIES OF SOILS. By T. Lyttleton Lyon and Harry O. Buckman. The Macmillan Company, New York. 1943.

Professional soil conservationists every day run into practical questions about soils. They can find some, but not all the answers in the new Lyon and Buckman text. The fourth edition (1943) is the work of Doctor Buckman and has been dedicated to the memory of his distinguished colleague.

The book is a standard college text, clearly written, thorough, and although rather severe no more so than most elementary texts in technological subjects. Therefore the authors presuppose a knowledge of freshman college chemistry and the equivalent of high-school physics, as they must in a book intended chiefly for second-year college students. The reader whose acquaintance with school or college sciences took place more than two or three years ago will find the going a bit rough in some parts, especially in chapters IV, VII and XIII, but the reward in understanding is well worth the effort.

The opening page is an excellent statement of fundamental viewpoints. The reader is invited into the wide field of edaphology which is soil and its relations to higher plants, rather than the more narrow confines of description and classification that make up pedology. When we accept the invitation we find that the discussions of principles and processes are mostly adequate for a beginner's approach through either viewpoint, and that the edaphological applications are clear as far as they go.

Organization of the material is for the most part good. Following the opening chapter on the soil in perspective, there are seven chapters primarily about the physics, chemistry and biology of soil materials and two chapters on soil moisture control. Then there are two chapters about soil formation and classification, two chapters about soil reaction and liming separated by one dealing with organic soils, and four final chapters that deal with nitrogen economy, fertilizers, manures, and fertility management of mineral soils. Naturally, no one arrangement can be ideal either for teaching or for the practicing technician who uses the book to brush up his knowledge of soils. It would appear that something might be gained by treating soil reaction more closely with other phases of the chemistry and physics of soil materials, and transferring the two chapters on water control, which include erosion control, to a position closer to those that deal with other aspects of soil management. Soil management and soil erosion control are essential parts of soil conservation farming and it is seldom, if ever, that one can be achieved fully without the other, or without water control and economy.

Deficiencies in the present text are decidedly the reflection of still undeveloped areas of soil science and technology rather than of Doctor Buckman's oversight or neglect. Some edaphological interpretations urgently needed by every soil technician, but not available now in any book, involve the practical significance for plant growth of the soil characteristics that can be identified by sight or feel and by simple tests such as the color test for soil reaction. Our soil technicians are gradually learning the significance, in crop responses, management needs, and erosion potentialities, of depth of the root zone, texture of the surface soil and properties that affect water movement in and below the root zone. As soon as the edaphological applications have been worked out in enough localities, a summary of the principles will be a welcome addition to textbooks on soils.

The book is an excellent exposition of the accumulated findings of laboratory and field-plot investigations, supported by enough and not too much quoted data to illustrate the principles that are involved. It contains a few references to field observations on the properties of different soils, although they are interpreted mostly for their pedological rather than their edaphological significance. This treatment leaves the college graduate, even if he has had a second course in soil fertility and management, at the best only partly prepared to see, interpret and use soil facts as he uncovers the subsoil and deeper layers with auger or spade. Practicing soil technicians will always have to learn much from Nature's textbooks. If they will set down in writing some of the things they learn, writers of more formal textbooks will be able to improve each new edition and help train young technicians to understand soil science and put it to work.

—J. Gordon Steele.

SOME ECOLOGICAL ASPECTS OF AFFORESTATION AND FORESTRY IN GREAT BRITAIN. By Sir Roy Robinson in Forestry, The journal of the Society of Foresters of Great Britain, Vol. XVI-1942.

The author reports on the results of many forestry experiments, mostly in tree planting in Great Britain, some dating from 1883, others from 1900 and 1909. His main thesis is that ecological succession can be greatly accelerated by planting appropriate combinations of "pioneer" and "successor" species. He described the principal planting site—"the bulk of the land which is available for afforestation has been grazed or periodically burned for long periods of time and in those processes has been greatly reduced in fertility, sometimes practically to bedrock. A good account of the effect of long-continued heather burning and grazing upon the moorland vegetation of the west of Scotland is given by Fraser. Perhaps the most striking change brought about by inclosure and cessation of burning in hill country is the great development of heather (Calluna vulgaris). Often the heather to begin with is so inconspicuous that it passes unnoticed, but land which was apparently green and grassy may quickly assume the appearance of a heather moor. It is such areas as well as those which originally were easily recognizable as heather moors which have given so much trouble in afforestation."

On the heather sites, pine (several species) are the pioneer trees and spruce and Douglas firs are the successors. Where pine and spruce are planted simultaneously, spruce immediately goes into check—in other words, it completely stagnates but continues to live. The pine immediately begins to grow. The emergence of the spruce from check corresponds with the development of the pine.

The first signs are the greening and the lengthening of the needles which usually happen about the eighth year when the pines are about 8 feet tall; the spruce trees at that time are very small. Next, the annual "leading shoots" increase in length and by the 12th or 14th year approach normal growth. After this the spruce may require more light, which is accomplished either by completely removing some of the pines or by pruning them. Where spruce or Douglas fir were planted alone, the condition of complete check already referred to continues indefinitely. The author shows pictures where the spruce adjacent to pine plantations responds to the latter's influence by growing normally, whereas, all of the rest of the spruce (not influenced by the pine) continues in check. He reports similar experiments on chalk sites which are basic in reaction while the heather sites are acid. On these soils spruce may sometimes be the pioneer species which develops the site to the point where such species as ash and beech will grow. (Note: Incidentally, Mr. McIntyre and I saw the same relationship between pine and hard maple on a 10-year old planting at State College, Pa., last summer. Where hard maple was planted alone it made exceedingly unsatisfactory growth, but where it was mixed with pine, both the pine and maple were making excellent growth).

All of this the author calls accelerated succession, and this is his hypothesis: "In the natural afforestation of difficult sites some species are pioneers and some are successors. It is not feasible by artificial means to bring in the successors in advance of the pioneers. It is possible, however, to accelerate the natural succession by mixed planting of pioneers and successors and by appropriate thinning treatment to complete the succession in the course of a single rotation. A successor on one site may be a pioneer on another."

A second hypothesis he calls the silvicultural stream: "In the silvicultural treatment of woodlands the most effective methods are does which proceed in the direction of a natural succession of vegetation." This is simply carrying the ecological concept from the plantations to forest management which he refers to as "a great stream moving slowly but relentlessly in a set direction. To move with it is easy, but to move against it is a constant effort with a certain risk of return to the starting point if the effort is relaxed." This is the familiar theory of the development of the climax forest type, and it is very excellently presented in the Harvard Forest Bulletin 21—1942, "Virgin Upland Forest of Central New England," by A. C. Cline and S. H. Spur.

By way of illustration of his theory of the silvicultural stream, the author cites the example of trying to underplant, with a new species, a recently cut-over coppice woods. The transformation is accomplished only by repeated cutting back of sprouts, and even then the site suffers in the process. He contrasts this undertaking with the more natural one of waiting until the coppice trees have about reached their maturity, when the canopy begins to break. At this time, success with under-planting is easily obtained, if the overhead coppice is killed gradually by "ringing" and in so doing there is little or no deterioration of the site.

The author frankly admits that he is not able to explain why the pioneer species effect such a remarkable change in the site which enable the successor species to grow. He mentions a theory about opening up and aeration of the soil but, he says, the same effect can be obtained by deep plowing. The change in the site effected by the pioneer species was probably due to intricate natural processes involving fungi, mycorrniza, earthworms, and micro-organisms. "The whole ecology of the site is modified, and in some way or other this change is connected with increased vigor of growth of the trees."

—JOHN F. PRESTON.

"CINCHING UP"

(*Continued from page* 190)

There are 134 million acres of range and pasture lands in the Northern Great Plains, with about half that area in soil conservation districts and land utilization projects. More conservation districts are being organized by the farmers and ranchers in order to get technical help in developing good methods of range management. Virtually all realize that the time to put ones house in order is in favorable periods.

Conservation technicians, experiment stations, and extension services have a bigger job than ever —and a lot more satisfying one than in the days when drought laid a heavy hand upon the unprepared livestock industry. It is always better to prevent troubles than to have to undertake emergency measures to counter disaster after it strikes.

WATER CONSERVATION

This clear pool is on the farm of Mr. and Mrs. House, a mile and a half west of Concrete, in Washington's coastal Skagit County.

The fish pond is but just one unit in a conservation program developed through the Skagit Soil Conservation District. It is stocked with cut-throat trout now ranging from 8 to 15 inches in size. Some day, House plans to build a larger pool.

Water that provides the fish with a constantly cool, fresh supply is piped from the hills above the 80-acre farm. With a nearly 100 foot fall in the water line, it also runs a turbine for electric lighting and refrigeration, including a frozen food locker, and supplies domestic and stock water. The water then is piped on down into the level alfalfa meadows seen in the background and used during the dry summer months in a sprinkler irrigation plant purchased and installed with soil conservation district assistance.

Both Mr. and Mrs. House were active in organization of the Skagit district.

REFERENCE LIST ☆☆

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SOIL CONSERVATION SERVICE

Soil Conservation Districts: State or Organization by States, Approximate Acreage, Number of Operating Units and Farms in Organized Districts. Soil Conservation Service. January 1, 1945. Mm.

OFFICE OF INFORMATION

U. S. DEPARTMENT OF AGRICULTURE

Double Superphosphate. Circular No. 718. Bureau of Plant Industry, Soils, and Agricultural Engineering, Agricultural Research Administration. December 1944. 10c.[1]

Handbook of Official Hay and Straw Standards. Office of Distribution, War Food Administration. Revised September 1944.

Report of the President of the Commodity Credit Corporation, 1944. War Food Administration.

STATE BULLETINS

All-Year Pasture System for Alabama. Circular No. 287. Agricultural Extension Service, Alabama Polytechnic Institute, Auburn, Ala. 1944.

Average Crop Yields Obtained in Important Soil Types in Central Illinois, 1925-1943. Agricultural Extension Service, University of Illinois, Urbana, Ill. Processed.

Bimonthly Bulletin. Vol. XXIX, No. 231. Agricultural Experiment Station, Wooster, Ohio. November-December 1944.

Commercial Fertilizers for Cotton Production: Gary Field, Money, Mississippi. Serv. Sheet No. 377. Agricultural Experiment Station, State College, Mississippi. 1944.

Commercial Fertilizers in 1943-44. Bulletin No. 662. Agricultural Experiment Station, Texas A. & M. College, College Station, Tex. October 1944.

Composting and Mulching. Press Bulletin No. 602. Agricultural Experiment Station, Gainesville, Florida. 1944.

Conservation Farming Keeps Your Soil Producing. Leaflet No. 71. Agricultural Extension Service, University of Kentucky, Lexington, Ky. 1944.

Experiments in the Control of Soil Erosion in Southern New York. Bulletin No. 811. Agricultural Experiment Station, Cornell University, Ithaca, New York. 1944.

Factors Affecting Composition of Everglades Grasses and Legumes, With Special Reference to Proteins and Minerals. Bulletin No. 403. Agricultural Experiment Station, University of Florida, Gainesville, Fla. October 1944.

Farm Manure, Its Production, Management, and Use. Bulletin No. 642. Agricultural Extension Service, Cornell University, Ithaca, New York. 1944.

Fertilizers for Fall Sown Crops. Circular No. 510. Agricultural Extension Service, University of Missouri, Columbia, Mo. 1944.

Fertilizing Burley Tobacco. Leaflet No. 63. Agricultural Extension Service, University of Kentucky, Lexington, Ky. 1944.

How to Buy and Use Fertilizers. Leaflet No. 64. Agricultural Extension Service, University of Kentucky, Lexington, Ky. 1944.

Inspection of Commercial Fertilizers and Agricultural Lime Products. Bulletin No. 122. Agricultural Experiment Station, Massachusetts State College, Amherst, Mass. September 1944.

Irrigated Pastures, Cost and Production Analysis, Orange County, 1943. Agricultural Extension Service, University of California, Berkeley, Calif. 1944. Processes.

Legumes of the Hawaiian Ranges. Bulletin No. 93. Agricultural Experiment Station, Honolulu, Hawaii. 1944.

Lime for Health on the Farm and Home Front. Circular WS 21. Agricultual Experiment Station, West Virginia University, Morgantown, W. Va. August 1944.

Lysimeter Experiments—VI: The Effects of Cropping and Fertilization on the Losses of Nitrogen from the Soil. Memoir No. 256. Agricultural Experiment Station, Cornell University, Ithaca, New York. 1944.

Mowing Pastures for Weed Control. Circular No. 216. Agricultural Extension Service, Texas A. & M. College, College Station, Tex. 1944.

Save the Soil: Make Oklahoma A Greater State, and a Better Place to Live. Biennial Report of the State Soil Conservation Committee, Stillwater, Oklahoma, Years 1943-1944.

Small Grain Varieties, Hill Soils, 1944. Information Sheet No. 319. Agricultural Experiment Station, State College, Mississippi. 1944.

Soil Conservation: The New Frontier. Biennial Report of the State Soil Conservation Board, Temple, Texas, for Period Ending August 31, 1943.

Soil Fertility Practices for Cotton Production: Heathman Field. Serv. Sheet No. 376. Agricultural Experiment Station, State College, Mississippi. 1944.

Soil Fertility Practices for Cotton Production: Schaefer Field, Yazoo County, Mississippi. Serv. Sheet No. 378. Agricultural Experiment Station, State College, Mississippi. 1944.

Soil Improvement in Alabama. Circular No. 290. Agricultural Extension Service, Alabama Polytechnic Institute, Auburn, Ala. 1944.

Soil Movement as Affected by Slope, Discharge, Depth and Velocity of Water. Technical Bulletin No. 78. Agricultural Experiment Station, State College Station, Raleigh, North Carolina. 1944.

Soil Tests for Lime and Fertilizer. Leaflet No. 74. Agricultural Extension Service, University of Kentucky, Lexington, Ky. 1944.

Some Factors Affecting the Utilization of Phosphoric Acid in Soils by Plants in Pot Experiments. Bulletin No. 647. Agricultural Experiment Station, College Station, Texas. 1944.

Sow Small Grain on Lespedeza Fields for Pasture. Leaflet No. 82. Agricultural Extension Service, University of Kentucky, Lexington, Ky. 1944.

[1] From Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.

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APRIL 1945

SOIL CONSERVATION

OFFICIAL ORGAN OF THE SOIL CONSERVATION SERVICE

TED STATES DEPARTMENT OF AGRICULTURE, WASHINGTON, D. C.

SOIL CONSERVATION

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SECRETARY OF AGRICULTURE · WAR FOOD ADMINISTRATOR · CHIEF, SOIL CONSERVATION SERVICE

ISSUED MONTHLY BY SOIL CONSERVATION SERVICE, U. S. DEPT. OF AGRICULTURE, WASHINGTON, D. C.

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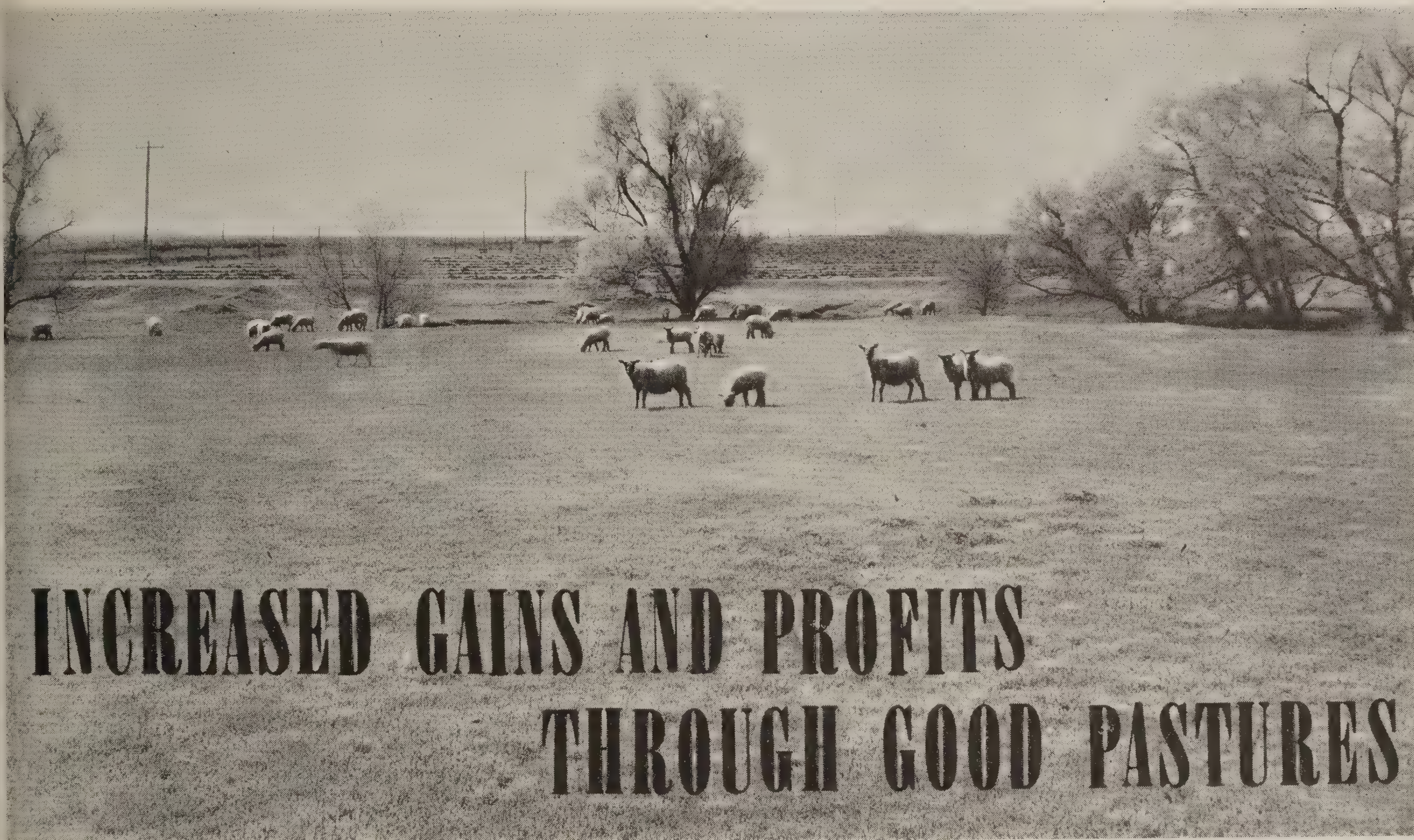
WELLINGTON BRINK EDITOR

CONTENTS

Front Cover: April orchard scene in Sonoma County, Cal. This method of cultivation is a far cry from that used in modern commercial orchards. Photographer: J. T. Allison.

SOIL CONSERVATION *is issued monthly by* SOIL CONSERVATION SERVICE of the United States Department of Agriculture, Washington, D. C. The matter contained herein is published by direction of the Secretary of Agriculture as administrative information required for proper transaction of the public business, with the approval of the Director of the Budget. SOIL CONSERVATION seeks to supply to workers of the Department of Agriculture engaged in soil conservation activities, information of special help to them in the performance of their duties. Copies may be obtained from the Superintendent of Documents, Government Printing Office, Washington 25, D. C., 10 cents a copy, or by subscription at the rate of $1.00 per year, domestic; $1.50 per year, foreign. Postage stamps, will not be accepted in payment.



INCREASED GAINS AND PROFITS THROUGH GOOD PASTURES

Well-sodded buffalo grass pasture and flock of grazing sheep on Steve Blaser farm near Stillwater. Buffalo grass has been held over the dry summer on the lower parts of this pasture by placing small dams in the creek, thereby forcing water to spread over the grass.

By HI W. STATEN

The 1940 agricultural census of Oklahoma lists 34,803,317 acres of land in farms. Slightly over 50 percent of this acreage can be classified as land used for pasture. Approximately 14 million acres are planted to cultivated crops each year and about 75 percent of these crops are used for the purpose of growing feed for livestock.

The position which pastures occupy in the agriculture of Oklahoma is changing as our state grows older. In the pioneer stage when there was an abundance of land, much of it was not utilized and pastures existed as an open range without regard to the quality of the land producing that pasture. As the state became settled and divided up into farms, each operator was confronted with the necessity of deciding whether the various acres within his farm should be regarded as arable land or pasture and woodland. These judgments are always exercised, sometimes well and sometimes badly. As time passed and new generations came, much of the best land was planted to clean-cultivated crops and the process of soil depletion began. Sometimes management revealed a very complete regard for the factor of depletion, but more often crops were harvested and fed or sold without regard to the maintenance of the productivity of the land. Thus, year after year, yields of our cultivated acres have declined and now we find in the State of Oklahoma approximately 2½ million acres of our one time fertile soil have been worn out and are now in the stage of abandonment. Three to four million additional acres are in a state of dangerous submarginal condition. One county which I have in mind produced 20 years ago around 40,000 bales of cotton annually but now produces only 7 to 8 thousand bales.

I believe the present trend of the thinking in Oklahoma is toward a better land use which, of course, must include soil fertility, erosion control and more and better pastures.

Good pastures, either native or tame, are the cheapest feed one can give to livestock. This factual statement cannot be challenged in any section of our country. The Kansas Experiment Station proves this statement in Bulletin 272.

EDITOR'S NOTE.—The author is in charge of pasture and grass investigations Oklahoma A.&M. College Experiment Station, Stillwater, Okla.

Cost of livestock nutrients from pasture and other crops:

Crop	Yield per acre		Cost of 100 pounds of digestible nutrients
Tame pasture mixture	2	tons	10.4 cents
Alfalfa hay	2½	tons	25.8 cents
Barley	20	bushels	51.8 cents
Corn	20	bushels	64.3 cents
Oats	23	bushels	76.3 cents

Pasture costs include use of land, seeding, fertilizers, preparation of seedbed and fencing so the area could be used for rotation pastures.

Figures collected by the United States Department of Agriculture in 16 states show that for each 100 pounds of digestible nutrients obtained from pasture, the cost was $.64; for alfalfa hay, $.83; for corn, $1.38, for corn silage, $1.54; and for oats, $2.02. These costs represent average conditions rather than specific examples. The above data show conclusively that pasture is the cheapest feed that can be grown on the farm for any kind of livestock. It is hard to realize the large amount of pasture grass which is necessary to feed an animal for a day. A mature cow will consume, under favorable conditions, 100 pounds or more of green feed in a day. This task must be accomplished with a 3-inch mower. A cow should spend about 8 of the 24 hours in actual grazing; the remaining 16 hours should be spent resting and chewing her cud. The cow is a very efficient "hay baler" and, of course, saves considerable labor and cost of providing feed through the year.

It must not be concluded that pastures will solve the entire feed problem. Good hay, silage and concentrates must be provided for the purpose of keeping the animal up to peak production and to take care of droughts and other unfavorable seasonal conditions.

Oklahoma Experiment Station Circular C-116, "Crop Calendars for a Year-Round Pasture Program," explains and illustrates ways and means of developing year-round green pasture schedules for the eastern, central and western parts of the state. The native pasture lands of Oklahoma are often thought of as having low productivity. This is because the pastures, as a general rule, are located on the poorest land of the farm. Where equally as good land is used for pasture as for other crops, the net income is as much or more than from cultivated crops and a wiser safer land use policy is adopted.

The fertility of our soils, particularly organic matter and minerals (calcium and phosphate), must be given serious consideration in the central and eastern part of our state in building and revitalizing our pastures. There are exceptions, particularly in the Arbuckle and Osage regions where sufficient minerals are available. The soils of the western part of the state contain sufficient min-

THE AUTHOR OF THIS ARTICLE SAYS—

1. Good pastures are the cheapest feeds one can provide for all classes of livestock. A much greater area of our cultivated land which is in the submarginal stage should be removed from cultivation and rededicated to pastures for the most effective and efficient land use policy. It is not unreasonable to conclude that more than 20 million acres of our farm land should be in pasture.

2. Management of our already existing pastures, particularly proper stocking, weed-mowing, non-burning, resting and rotation-grazing to allow reseeding, is worthy of major consideration in increasing gains and profits of livestock in Oklahoma.

3. Soil fertility, with emphasis on the mineral program in central and eastern Oklahoma should be stressed.

4. Better than 75 percent of the agricultural land in Oklahoma is used directly or indirectly for livestock production. This means that the end-product of the agriculture in Oklahoma is and should be livestock. Since more than 50 percent of our agricultural land is used for pastures, and through pastures we can produce our greatest and most economic gains and profits, our pastures should be No. 1 on our program for better agriculture in Oklahoma. This is especially true at the present time because of the historical number of livestock on our farms and ranches; the need for livestock products to help win this war; the need for a more stabilized agriculture in the postwar period; the need for a more stable and sound land-use policy; and particularly in view of the fact that our pastures are on the downgrade in production. The trend of pasture condition should be leveled off and started on the upgrade. This can be done by cooperatively planning a sound land-use program in Oklahoma.

Winter small grains and annual rye grass are tested at the Oklahoma Experiment Station for forage yield and suitability for pasture.

erals for fine grass production, but supplementary pastures should be provided for the purpose of lengthening the grazing season, relieving the load from the already overgrazed native pastures and reducing feeding costs.

The native pastures of central and eastern Oklahoma are badly overgrazed and weedy. They do not provide good grazing for longer than 4 to 5 months of each year. During the other months livestock must be dry-fed or additional pastures made. It is easy to provide these additional pastures through the use of Bermuda grass, ryegrass, small grains (wheat, oats, rye and barley), Korean lespedeza and hop clover planted in the small grains, and other grass and legume crops, namely sweet clover, black medic, bur clover, white Dutch, ladino clover, etc.

For example, a few acres of Bermuda grass with lespedeza, a summer-growing legume, and yellow hop, white Dutch, black medic or bur clover, all of which are winter legumes, added to the permanent Bermuda pasture will provide fine grazing for 8 to 9 months of the year. The carrying capacity of this kind of a pasture often is 1 mature animal to each acre. Income in beef per acre has been measured in many sections of the eastern part of Oklahoma and Arkansas, and it has been found that a good Bermuda-legume pasture which has sufficient soil minerals will produce 300 to 400 pounds of beef annually. Winter small grains or ryegrass with hop clover or Korean lespedeza make a fine supplemental pasture which adds several months to the grazing schedule. Records show that such a pasture will produce 150 to 200 pounds of beef per acre through the grazing season. A pure stand of grasses, either native or tame, in central and eastern Oklahoma is not sufficient. The high protein content of grasses does not last much longer than 2½ to 3 months, but when a legume is added the high protein content of the forage can be extended through the entire growing season. Therefore, it is very important that wherever possible a legume should be added to a grass pasture.

The native grass pastures of the western section are well supplied with plant nutrients, particularly minerals, and the nutritive value of the grasses is very high throughout the year. This is largely due to the high mineral soils, the low rainfall and the native grass species common to the west. Buffalo and blue grama species are predominant in this part of the state and are classed as hard-

stemmed grasses. These hard-stemmed grasses are capable of holding the plant nutrients regardless of weather conditions. Native pastures of western Oklahoma which are well managed (properly stocked and weeds mowed) are capable of producing 75 to 100 pounds of beef per acre through the grazing season.

The native pastures of central and eastern Oklahoma consist primarily of the tall bunch grasses (big and little bluestem, Indian and switch) and are commonly known as soft-stemmed grasses. These species lose their plant nutrients very rapidly during late summer and fall through leaching. They are highly fibrous through the winter but do provide considerable feed if allowed to mature a seed crop.

One of the most important pasture management problems in all sections of Oklahoma is weed control. Most of our weed species are bitter and highly unpalatable. These weeds rob the grasses and legumes of soil moisture and plant food, and prevent them from receiving the necessary sunlight for proper growth. Weeds also are obstructions to uniform and efficient use of the palatable forage. Pasture burning will not control weeds. In fact, burning increases the weed population and decreases the grasses and legumes. It is highly important to plan and execute a weed-mowing and non-burning pasture program in Oklahoma if we expect to maintain efficient production of our pastures. In fact, many of our fine native tall grasses are rapidly disappearing in our pastures and may become extinct unless they are more carefully protected.

Another very serious pasture problem is that of soil fertility. It has heretofore been mentioned but is worthy of repetition. Most of our pastures in central and eastern Oklahoma are confined to the poorest soils. These soils are low in minerals, particularly calcium and phosphorus. Chemical analysis made by the Oklahoma Experiment Station shows that grasses grown on limestone soils are much higher in mineral content than grasses grown on sandstone soils. Pastures well supplied with minerals are more nutritious and palatable than those which lack them. Several experiment stations, particularly the Missouri Experiment Station, have proven that the "old cow," often called the "dumb brute" is smart enough to select pasture or hay which is grown in high mineral soils. Nature does a wonderful job of converting soil nutrients into complex chemical compounds and making them available and usable to the animal body for building bone, muscle and fat through plant life. We are not yet smart enough to duplicate this natural process through synthetics. It is also an established fact that cattle can stand knee-deep in green grass and literally starve to death. Sunshine and soil moisture may make lots of green herbage, but fertile soil, plus sunshine and moisture, is necessary in the production of nutrient feeds.

FOREST SERVICE ROUNDS OUT 40 YEARS

Congratulations go to the U. S. Forest Service, which celebrated its 40th anniversary on February 1. On that date Gifford Pinchot, visited the office of Lyle F. Watts, present chief of the Service, to take a look at some of the wood products developed and improved by Forest Service scientists. Mr. Pinchot, former governor of Pennsylvania, headed the Forest Service in 1905 when it was first set up under President Theodore Roosevelt.

The Soil Conservation Service has assisted farmers and ranchers with the construction of more than 21,500 ponds. Many of them are not primarily for fish production, being built especially for stock water and other purposes. Last year, however, 2,451 ponds, carefully stocked with 3,090,000 fish, were placed under specific management of a kind intended to provide continuing yields of about 250 pounds of fish per surface acre per year.

"A good job of contour farming, the planting of gullies, the revegetation of lands so steep that they should not be farmed, or a general program of building up or maintaining soil fertility, certainly will be reflected in increased wildlife populations." —Ira N. Gabrielson, director, Fish and Wildlife Service.

DISTRICT PROFILE

BILL ROPER, LANCASTER LEADER

Ask anyone who is familiar with the soil conservation movement in Pennsylvania to name the farmer who has done most to further soil conservation in the State, and the answer is pretty likely to be "Bill Roper."

Hartwell E. Roper is an outstanding conservation leader in an outstanding agricultural county, Pennsylvania's famed Lancaster. Moreover, his leadership is not confined to his home bailiwick or to the Lancaster Soil Conservation District. In Harrisburg, the state capitol, in Pennsylvania's five other districts, and in the portions of the state which have no districts, Bill Roper's knowledge of and profound belief in district philosophy and in soil conservation principles and practices, together with his modest but natural leadership, have proved invaluable in getting attention and action from fellow farmers, from civic leaders and from members of the legislature.

Bill Roper, was born in New Jersey and graduated from the Massachusetts State College in 1928, majoring in animal husbandry. After three years spent in travelling across the continent and working on farms in Massachusetts and Washington, he came to Lancaster county. He bought 122 acres of land, near Kirkwood, which would barely support a dozen head of cattle. For five years Roper worked his land in accordance with conventional farming methods. **By 1935 he had raised one of the biggest gullies in Lancaster county; it must have been 400 feet long, 20 feet wide and 10 feet deep, and it kept cutting back each year.** He was afraid the gully would cut his farm in two in a few years more, and he was disheartened about the outlook for the whole farm.

In 1936 the Soil Conservation Service was starting demonstration on Lancaster county farms, and Roper was one of the first farmers in the county to agree to undertake a soil conservation program. He balked at first at some parts of the plan which the Soil Conservation Service technicians prepared for him. In a very short time, however, he became thoroughly sold, not only on his own program, but on the whole conservation idea. In the spring of 1938 he was one of the 238 Lancaster farmers who voted for the establishment of a soil conservation district; and because even then his interest and

Hartwell E. Roper, chairman, Lancaster Soil Conservation District.

leadership in the district movement were beginning to be felt, he was made chairman of the board of district supervisors.

Roper has shown an almost uncanny knowledge of district philosophy as it relates to local people, to district governing bodies and to assisting agencies. He and the other district supervisors have been singularly successful in guiding the Lancaster district in group participation by farmers, supervisors and the staffs of cooperating agencies and organizations. As his influence and leadership grew, Roper unassumingly took over statewide responsibilities and tasks for which he was so peculiarly fitted. **On his own time and frequently at his own expense, he attended and spoke at meetings of farmers, of civic groups, and of legislators.**

(*Continued on page* 227)

FIGHTING SOIL EROSION IN BRITAIN'S COLONIES

Great efforts are being made to halt the drift of soil in Basutoland, Bechuanaland and Swaziland, where erosion is at its worst. Here a deep donga is being formed by water rushing down from overgrazed veld, through a road culvert and under a railway bridge. State roadmakers and railways, says the author, must cooperate with the farmers in fighting soil erosion.

By G. M. RODDAN

In Britain's colonial dependencies it is now increasingly realized that soil erosion has become progressively serious as the influence of the white man has spread. He brought peace, and skilled medical, agricultural and veterinary services were established. This led to increased human and animal populations, and the soil was called on to produce more food. Commercial interests saw to it that inducements were offered to increase production from the land of products surplus to the subsistence needs of the inhabitants. These influences have caused an increasing exploitation of Nature's resources and have brought in their wake the evils consequent on deforestation, insufficient resting or fallowing of cultivable land and overgrazing by the flocks and herds of the pastoralists.

When land is first opened up from natural forest or jungle the soil is of excellent structure. It is granular, has a high humus content, and is capable of absorbing and retaining a good supply of water. With each successive cultivation the structure is destroyed and the water-absorbing capacity reduced. The result is that more and more of the rainfall runs off the land, carrying with it the valuable smaller particles of soil and plant nutrients. After heavy rain we have all noticed how the rivers, streams and tiny brooks all run red and muddy. Soil is being moved. Many of Britain's dependencies are subject to torrential rains, and such downpours accentuate soil movement.

European government officers, traders and planters were trained under and accustomed to temperate climatic conditions. Bitter experience has shown them the rapidity with which deterioration and loss of soil take place under tropical downpours, soil-parching sunshine and prolonged droughts. Erosion is a most insidious evil because the early stages are not obvious to the inexperienced eye, and once the "squander bug" has gained a footing wastage proceeds rapidly.

In recent years the Colonial Agricultural, Forestry and Veterinary Departments have been fully

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Editor's Note.—The author is a Bachelor of Science and holder of the National Diploma in Agriculture; he has spent 12 years in Sierra Leone in swamp rice development as agricultural officer. This article is presented by courtesy of the British Information Services.

aware of the enemy in their camp. The first sign of erosion noticed may be loss of soil fertility. In the wet tropics, one is struck by the luxuriance of tropical vegetation and the apparent fertility of tropical soils. Experience soon shows that intrinsically such soils are poor. As the soil loses its fertility it also loses stability and is unable to maintain its position when attacked by the forces of nature.

In 1937 Sir Frank Stockdale, then agricultural adviser to Britain's Secretary of State for the Colonies, reviewed the position in regard to soil erosion in the various dependencies. Successive Secretaries of State for the Colonies have drawn the attention of colonial governments to the matter and have stressed the importance of regarding soil conservation as a matter of major policy having direct bearing on the welfare of the communities.

To assist Governments, the resources of which were insufficient to embark on conservation projects, the provision of grants from the Colonial Development and Welfare Fund was contemplated.

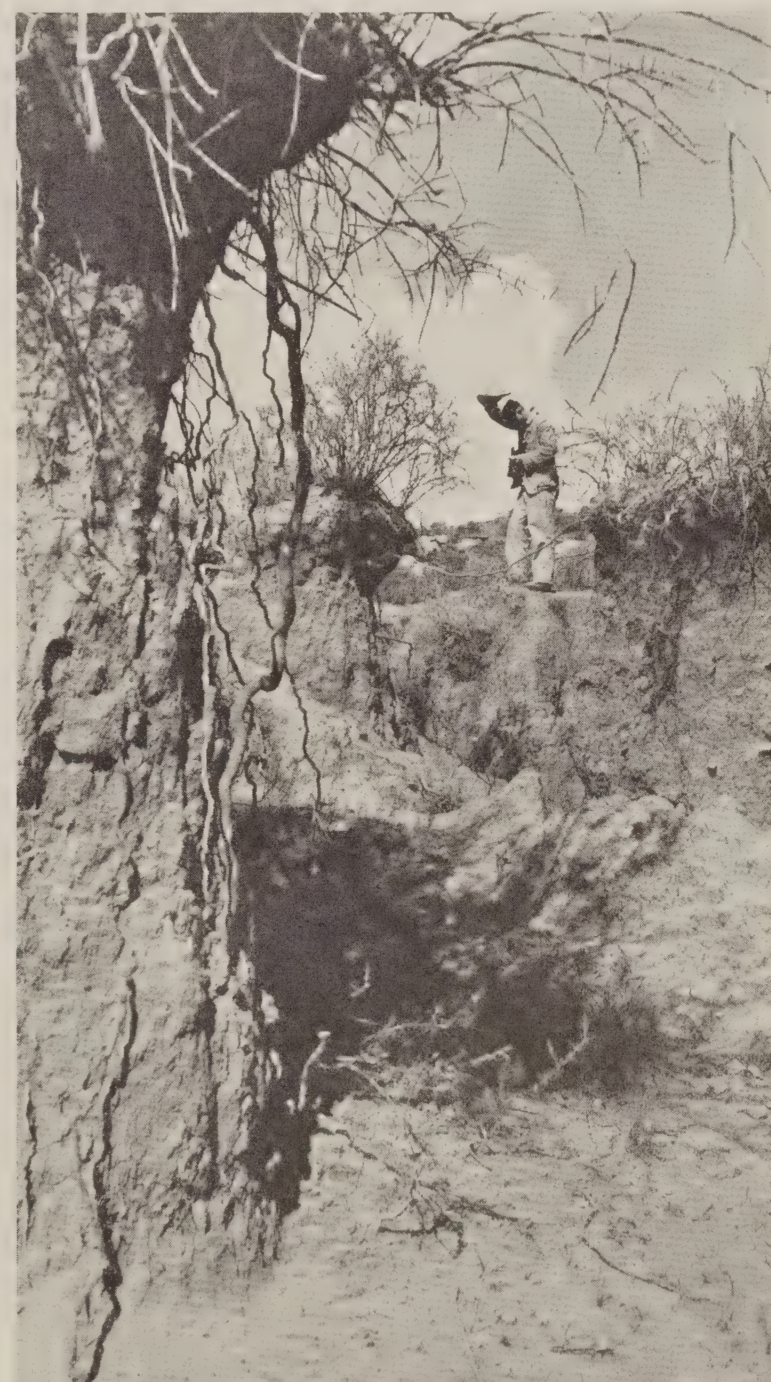
Although developments have to some extent been impeded by the shortage during wartime of staff, labor and equipment, the matter is under continuous review and marked progress has been made. The object of a soil conservation policy is two-fold—to repair and to prevent damage. This necessitates a revolution in many of the established native systems of agriculture and animal husbandry, though modifications are adapted to suit the ways and needs of the cultivators and pastoralists themselves. Soils and climate vary from colony to colony, and consequently it is necessary in each locality to ascertain by experiment the system best adapted to the conditions. The even more difficult task follows of securing the adoption of these systems by cultivators.

Much progress has been made in devising and in securing the adoption of systems of mixed farming aimed at maintaining the fertility of the soil, and incorporated in these systems are methods designed to counteract the dangers of erosion. As apprehension of the position grows, so willingness to co-operate increases.

In the dependencies the most widely prevalent form of erosion is sheet erosion, but in places ex-

Damage from soil erosion is most serious in the High Commission Territories of Swaziland, Bechuanaland and Basutoland. Excessive grazing and uncontrolled runoff of storm water have removed millions of tons of soil. This horrible example of erosion is on the town lands of Aliwal North.

Tree roots fight hard to bind the soil, but without a protective cloth of grass theirs is a losing battle. Trees alone cannot stop erosion.



tensive gullying also occurs, while in drier areas wind erosion is a serious menace. The chief contributory causes have been excessive deforestation, cultivation of hillsides which should never have been opened for cultivation at all, unsuitable methods of cultivation and the growing of crops conducive to erosion without adequate cultural safeguards, lack of protection from wind, and excessive concentrations of livestock leading to overtrampling and consequent soil loss.

Damage from soil erosion is most severe in the High Commission Territories (Swaziland, Bechuanaland and Basutoland) and in the East African dependencies. If somewhat less severe in West Africa, considerable damage has been done in the northern parts of Nigeria and the Gold Coast, and over-cultivation, particularly of hillsides, has left scars on the impoverished uplands in Sierra Leone.

The position varies greatly in the West Indies, but is very serious on the more mountainous islands. In Palestine and Cyprus too, erosion has reached an advanced stage.

Measures taken to repair and prevent the damage done by erosion may be grouped under three heads—(1) agricultural, (2) forestry and (3) mechanical. Under (1) are comprised ploughing and planting along contours, the use of grass strips and live wash-stops, the planting of windbreaks, the use of cover crops, the control of grass and bush burning, and the improvement and controlled grazing of pastures. Under (2) the establishment of forest reserves and reafforestation of denuded or threatened areas, and under (3) the construction of contour bunds, terraces, stops and dams for the checking of gully erosion, and the provision of wells and water supplies, thereby removing the need for concentration of human and livestock populations.

In Kenya a special soil conservation branch of the Department of Agriculture was instituted in 1938 and since that date by ordinance and rule the authorities have been given wide powers for the protection of the natural resources of the country. Surveys are being carried out to provide data for long term planning, and a considerable amount of protective work has already been done. This includes the construction of narrow-based terraces on 70,000 acres and live-wash-stops on over 17,000 acres in the Central Province in 1940; 200 grassed drainage ways were established. In 1941 some 2,200 miles of variable grade and contour lines were set out. And in Nyanza Province banks and trenches have been constructed to control erosion on 44,000 acres. Demonstration centers have been established, and around Msau the local native council have set aside large areas for reforestation.

In Uganda also considerable progress has been made. To ensure co-ordination of the various services, a Development and Welfare Committee was set up in 1940. Much attention has been paid to the control and protection of grazing grounds and to the provision of watering facilities for stock. A system of rotational grazing has been widely adopted, tsetse infested areas have been cleared, and the sale of stock organized. The area of reserved forest has been increased by some 380 square miles. In the cultivated areas the practice of strip cropping, whereby narrow grass strips are interposed between the cultivated contour strips, has been widely adopted and the people are really becoming erosion conscious.

In Tanganyika the active co-operation of the people has been obtained, and one of the features of the work in this territory is the organized tribal turnout of labor for conservation works. Thus, in the Central Province a 10-year program has been laid down which aims at controlling erosion on 5 million acres of pasture and 1 million acres of cultivated land. Large grazing areas have been reserved for use during the dry season. Hundreds of hilltops have been closed to cultivation, gullying has been controlled and many acres of communal fuel plantations planted up.

Further south in Northern Rhodesia, where the traditional system of millet cultivation involves the annual lopping of trees over a large area to provide material for burning on the cultivated patch, controlled rotational lopping has now replaced indiscriminate destruction. Strict control of burning is enforced. Whole villages, involving some 18,000 people, have been moved from impoverished areas and settled in an orderly manner in their new lands. Here the land for cultivation is laid out in blocks and between each block contour strips of vegetation are interposed.

Nyassaland received a free grant of $66,000 from the Colonial Development Fund in 1940 to assist in defraying the cost of anti-erosion measures. Surveys are now being conducted to determine areas suitable for settlement so that the pressure on over-worked land can be relieved. The relief of the congested areas is one of the main problems, and an administrative unit has been set up to determine in a practical way how the whole village life can be reconstructed so as to preserve the natural resources of the land.

(*above*)
Grass will grow here again. As soon as a dam has been completed, indigenous thorn bushes are felled and placed on the silt flats to shade the soil and allow the grass seeds to germinate. In a year or two a protective covering of grass will cover the soil and regulate the flow of water.

This dam is in the Vlakpoort reclamation area. Leading methods of combating soil erosion in Basutoland, Bechuanaland and Swaziland include terracing, contour cultivation, prevention of gullying by planting grass and trees on contour banks, provision of water supplies, planting of fuel reserves, controlled grazing, fire control, and improved farming practices.
(*below*)

In Somaliland where the beneficial effect of the scanty rainfall is greatly reduced by desiccating winds the inhabitants are nearly 100 percent pastoralists. The population, both human and livestock, is tied to the few sources of water for the greater part of the year and such concentrations do immense damage. Surveys have been made and it is hoped to formulate a general grazing plan for the country.

In Basutoland, Bechuanaland and Swaziland erosion is a very serious problem but a great deal has been done to ameliorate the situation. To Basutoland was made available $640,000, to Bechuanaland $556,000, and to Swaziland $84,000 under the Colonial Development Fund. Excessive grazing and uncontrolled run-off of storm has removed millions of tons of soil from these territories. The main methods adopted to control this destruction are terracing, contour cultivation, the prevention of gullying by planting grass and trees on contour banks, the provision and protection of water supplies, the planting of fuel reserves, controlled grazing, fire control, and the introduction of improved farming practices.

Soil erosion is not so widespread in the West African dependencies, nor, in general, is it so far advanced. In the north of the Gold Coast and of Nigeria problems are similar to those of East Africa, and sheet and gully erosion and uncontrolled grazing and burning have led to soil degradation. The prevention of grass fires, the introduction of mixed farming, involving the increased use of farmyard manure, reforestation and the planting of fuel supplies are all measures aimed at conservation of natural resources. In Sierra Leone rice cultivation on river swamps and in valley bottoms is being fostered in order to relieve the pressure on the overworked uplands. To assist in implementing this policy, surveys were carried out, a grant and a loan of $1,212,000 was made under the Colonial Development and Welfare Act and experienced irrigation and drainage engineers engaged. The work is making progress.

In the Mediterranean and Eastern dependencies many of the countries are more highly developed and some of them, such as Malta and Palestine, have very ancient traditions and civilizations. The problem of soil erosion in such countries was recognized in ancient times, but many of the structures for control have been allowed to fall with disrepair. A determined move to remedy this lapse is now being made and soil conservation is well to the fore in the development policies of these territories. Irrigation and control of flood water receives much attention.

In the West Indies the gravity of the position varies greatly in the different dependencies. The subject has received much prominence in recent years and it can be claimed that public interest and awareness has been awakened. Great efforts are being made to devise and introduce farming practices which will maintain fertility and conserve the soil. Simple mechanical measures of soil conservation are being advocated. The rapidly increasing density of the population in many of these dependencies demands that the productivity of the land should be maintained at its maximum if a reasonable standard of living is to be assured to the inhabitants. By the means of propaganda, demonstration and legislation many forward strides have been taken. Contour cultivation, terracing, strip cropping and contour drainage are all being practiced, but each particular eroded area requires individual consideration and appropriate practical control measures.

Anti-erosion demonstration plots on hillsides are now giving yields greatly superior to those of the unprotected lands, and planters and native cultivators alike have been impressed by the results obtained and are copying the practices demonstrated. In all of the many land settlement schemes now in being, soil conservation receives great prominence. Agricultural staffs have been considerably augumented, officers for full-time employment in soil conservation have been appointed and long-term research on the problem is to be instituted.

Although soil erosion is still one of the main problems to be faced, it can be claimed with justifiable pride that despite the handicaps imposed by wartime conditions great progress in devising and applying soil conservation measures has been made in recent years. Funds provided by the Imperial Treasury through the Colonial Development and Welfare Fund have played no small part in making this progress possible. Of great importance too has been the awakening of public interest in this work, and in many territories the people are aware of, and have willingly accepted, the duty they owe to future generations of preserving their means of livelihood—the soil.

The 13,000,000 acres needing biology practices pose some problems upon which farmers and ranchers will need the help, not only of soil conservationists, but also of wildlife technicians and others. Some of the problems are of a community nature beyond the scope of the individual land operator. Among these are frequently those pertaining to streambank and spoilbank management.

FARM FORESTRY PROJECTS IN TIME OF WAR

The perfect crop for conserving water and preventing soil erosion. These trees are in a well-managed Maryland woodland.

By JOHN W. KELLER

Five years of operation of farm forestry projects were completed June 30, 1944. Only about half of the present projects were established during the first year. War seriously interfered with the continuity of administration, but the results in terms of demonstrating the place of woodlands in farm economy, have amply justified the initiation of the projects. This summary affords only a faint idea of the benefits derived because it will require at least another decade to build up growing stock in woodlands, records in the books, and new habits and philosophy toward the woods.

The Soil Conservation Service during the fiscal year 1944 was responsible for 46 farm forestry projects in 32 states. Each of these projects is a representative of a major farm forestry problem area. Seventy-five percent of the projects are located wholly or partially within soil conservation districts. Each is administered by a technically qualified forester who assists farmers in planning and applying, as a part of their farm business, woodland management operations suitable to the individual farm. Careful records are kept of the condition of the woodlands, the expenses incurred by the owner for labor, team, and equipment, the income from sales of wood products, the value of the wood products used on the farm, and other information indicative of what similar woodlands within the problem area should yield, and the importance of farm woodlands in the farm economy. These projects, in effect, are becoming more and more pilot plants for reinforcing the work of farm planners currently talking to farmers about the woodland as a farm enterprise. They need data on woodland values, income, and practices. They are interested in knowing how to solve marketing problems, and in new woods tools to help farmers cut more forest products. These things are the stock-in-trade of the farm foresters; these are subjects in which they are becoming experts.

Annual reports submitted by farm foresters for the fiscal year ending June 30, 1944 cover the activities of 41 projects. Five other projects are new and were without foresters for a large part

EDITOR'S NOTE.—The author is assistant chief, Forestry Division, Soil Conservation Service, Washington, D. C.

of the year. Due to the lack of qualified foresters, four projects that submitted reports were without foresters for six months or more during the fiscal year.

Administration of farm forestry projects is through the State Forester in cases where state funds are used to match federal funds in making up the annual budget and in such cases, farm foresters report to the State Foresters. In the absence of this cooperation, the entire budget is provided from federal funds and the farm foresters are responsible to the district conservationists of the Soil Conservation Service. Of 46 operating farm forestry projects, a total of 16 were administered by State Foresters and 30 were administered by the Soil Conservation Service. Thirty-four are located wholly or partially within soil conservation districts, and operate under the sponsorship of the district governing body. The average annual cost of administering a farm forestry project, including both federal and state funds, varied from $3,200 to $4,427. The federal government contributed $122,110; states and counties, $30,142. The states, therefore, advanced about 20 percent of the total operating costs of the projects. West Virginia leads in number of farm forestry projects, with four.

Complete farm plans for 389 farms embracing 99,118 acres, and woodland plans for 427 farm woodlands including 48,083 acres were written during the year. Only 40 out 427 tracts of woodland were planned separately from the farm. By including woodlands as a part of the farm and utilizing farm labor and equipment annually in harvesting wood products, the farmer secures maximum returns.

Two types of cooperators are assisted by farm foresters. Type I are those who have become cooperators because they are interested in growing, developing, and managing their woodlands as producing units of their farms and are willing to keep annual records to show the results of management. Over a period of years these detailed records will furnish data to show the value of farm woodlands to the farm economy. Type II are those concerned chiefly with the proper method of cutting and marketing of woodland products for sale, primarily to help the war effort. Farm and woodland plans are written only for Type I cooperators, and during the year 427 woodland plans were written. Assistance was requested of farm foresters by 1,090 woodland owners and help was given to 603 who became Type II cooperators. Their woodlands represent an area of 39,451 acres. The records show that 319 of these Type II cooperators carried on cutting operations on 20,924 acres in accordance with the farm forester's recommendation.

A Pennsylvania farmer working up his winter fuelwood with a Sandvik one-man saw.

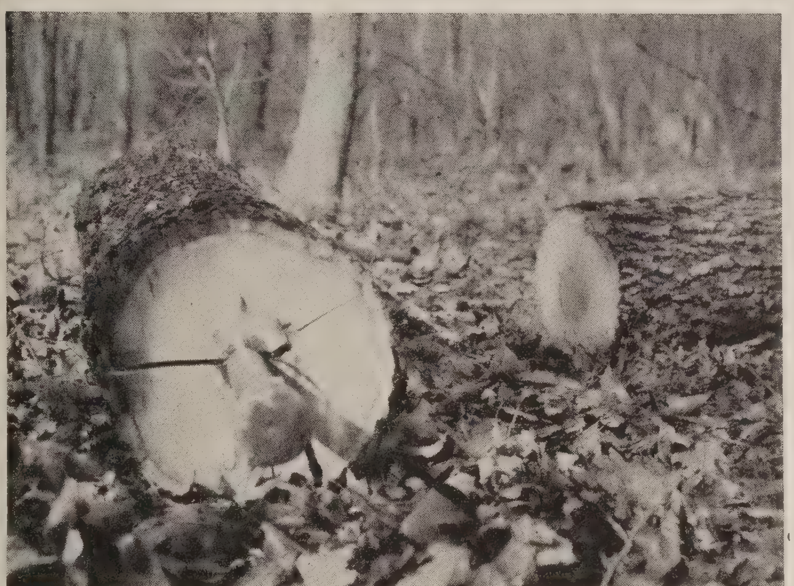
Assisting the war effort by getting the highest production of wood products was the most important activity of farm foresters during the year. War needs were so great that a large part of the farm forester's time was spent in urging farmers to carry on timber harvest operations and in assisting saw mill and woods operators to produce the maximum. Involved in this were such things as clearing through ration boards requests for truck tires and gasoline for hauling logs, securing deferment of woods labor through draft boards, arriving at interpretations of OPA instructions and regulations, working with T.P.W.P. personnel, War Boards, O.D.T. representatives, and other war-time agencies.

Principal wood products removed were logs, poles and piling, crossties, pulpwood, fence posts, and fuelwood. The total production by the 1,030 Type I and Type II cooperators amounted to approximately 35,000,000 board feet of logs and lumber, 280,000 linear feet of poles and piling, 300,000 feet of fence posts, 10,000 cords of pulpwood, and 27,000 cords of fuelwood.

Labor shortage was the greatest obstacle to expediting work on farm woodlands. At some locations, woods work was stopped and in most places it was retarded. Some farmers were compelled to purchase coal or buy fuelwood to meet domestic needs because they could not get fuelwood cut in farm woodlands. Still other farmers had to hire labor to cut fuelwood, and many farmers were forced to sell stumpage instead of processed products.

Cooperative organizations are encouraged by farm foresters in every practical way. These cooperatives are composed of local farmers who band together for fire protection, or to get the best prices. Four cooperatives organized within farm forestry projects were active during the year. The Holmes Creek Farm Forestry Cooperative in Florida, at the end of the third year, has a membership of 39, with a total of 4,137 acres of farm woodlands receiving fire protection. This cooperative has a two-ton fire truck, back-pack pumps, and other hand equipment suitable for fire control.

The Winona Wood Products Cooperative Association, Inc., in Minnesota, has a sawmill, milling equipment, and a power unit that may be moved from one location to another where farmers have their logs ready for processing. Farmers are being urged to produce more wood products to meet their own needs of both rough and finished farm grown timber.



Weber splitting gun before explosion. It is used on a Pennsylvania farm forestry project to split logs for easy handling.

The Turtle Mountain Woodland Products, Inc., in North Dakota, handled over 56,000 fence posts and 300 cords of fuelwood during an 8-month period last year. A year ago this cooperative declared a patronage dividend of 18 percent that was paid to 15 paid-up shareholders and 64 patrons, and the annual sales amounted to approximately $12,000 in addition to sizable stocks on hand. Equipment includes a 50-pound trip hammer, a 2-HP electric motor, two concrete post-treating tanks of 60-post capacity each, and similar equipment. This cooperative is now considering the purchase of a saw mill and is putting on a campaign to get more local lumber cut.

A saw mill cooperative in Idaho boasts that all members are farm forestry cooperators. They have a sawmill that is moved from community to community within the project area and farmers harvest and process woodland products, first for home use and later for sale.

New tools and equipment are introduced by farm foresters for saving labor in woods operations, and for speeding up production. Farm foresters on 16 of the 41 reporting farm forestry projects have introduced various types of power equipment, chain saws, Sandvik bow saws, Weber splitting guns, new types of wood burning stoves, logging equipment, log trailers, tree-planting machines, post-treating plants, poisons for killing stumps, etc. Farm foresters are keeping up to date in new developments affecting farm woodlands; tools, equipment, and materials that show promise are being tried in an effort to give farmers every possible advantage to prove that farm woodlands constitute an important part of the farm business.

Lump sum sales are discouraged by farm foresters, but unfortunately the annual reports are comparatively silent on the trends in the various localities. Seven projects report increases in stumpage sales because of lack of farm labor. Under war conditions it is difficult to get farmers to process their own wood products, derive the benefit of supervision of their own woods operations, and use farm labor that otherwise would not be fully used during the winter months. These are important factors in increasing returns from farm woodlands.

Educational activities require much of the farm forester's time. The annual reports show that 29 projects held forestry meetings and field trips, 14 farm foresters used the radio and local meetings to present the possibilities of farm woodlands, 17 farm foresters supplied local papers with news stories concerning the projects, and 9 farm foresters put on woodland exhibits at local fairs and other gatherings.

Except in a few localities, fire protection is not considered of major importance in the growing of products in farm woodlands; only 14 out of 41 projects report fire protection as a serious problem. While the leadership in the control of fires is recognized as the responsibility of the State Forester, farm forestry cooperators are shown the damaging results of forest fires and are trained in modern methods of fire prevention and control.

Net returns from farm woodlands vary greatly, as might be expected, due to wartime prices, locality, demand for labor in war industries, and the general condition of the woodlands. During

the year the returns per acre varied from 95 cents to $12.87, and farm labor earned from 56 cents to $2.44 per hour for wood work. The average net earnings amounted to $320 for each of the 509 farms, and a per acre income of $3.31. In the fiscal year 1943 net earnings amounted to $258 per farm and $2.47 per acre. It must be remembered that most farmers are still selling stumpage and therefore failing to get returns on labor, either as wages or as profits in selling processed products.

The fact that the average cut did not exceed 200 board feet, or about one-half cord per acre for all products converted to these units of measurement, will indicate to foresters that these farmers have not been cutting up to production capacity. In other words, $3.31 net income per acre does not begin to represent the full reward of woodland management.

A tangible measure of the farm foresters' accomplishment is the production of the equivalent of 60 million board feet of wood products which was an outstanding contribution to the war effort. However, the intangibles add up to yet higher values: educational activities, record-keeping, convincing the farmer that the woodlands are part of the farm, building up woods appreciation, etc. These are the things that over a period of years will establish farm woodlands as important enterprises in the farm economy. While most of the accomplishments of farm forestry projects are in the field of farm economy, farm foresters, are not overlooking the part played by farm woodlands in the broader program of the Service. Trees are the perfect crop for the conservation of water and the prevention of soil erosion, and well managed farm woodlands play an important part in reaching the goal set by the Soil Conservation Service.

Returns from Managed Woodlands, Type I Cooperators, 1944

Project	No. of Farms	Woodlands under mgmt. (Acres)	Net Income		Total		Per Acre	
			Total	Per Acre	Converted to: Ft. BM	Converted to: Cords	Converted to: Ft. BM	Converted to: Cords
CF–1	40	7,097	$27,231	$3.83	235,700	5,885	333	.83[1]
2	33	4,950	16,597	3.35	833,755	2,200	168	.44[1]
Co–2	4	180	644	3.55	23,000	59	128	.33
Fla–1	11	1,239	3,421	2.76	310,335	776	252	.63
Ind–1	15	512	1,811	3.54	189,560	474	370	.93
2	34	1,123	6,122	5.44	278,400	696	248	.62
Ia–1	8	160	287	1.79	61,600	154	385	.96
Ka–1	29	703	5,665	8.06	290,000	727	412	1.03
La–1	27	2,826	4,077	1.44	357,600	894	126	.32
2	6	569	5,640	9.91	395,700	989	695	1.74
Md–1	12	612	600	.98	122,115	305	200	.50
Mich–1	35	873	4,928	5.64	229,550	574	260	.65
Minn–2	20	1,460	2,909	1.99	267,200	668	183	.46
Miss–2	37	5,108	10,780	2.11	906,326	2,266	177	.44
Neb–1	12	548	2,633	4.80	88,200	213	161	.39
ND–1	30	4,523	4,340	.95	415,000	1,037	92	.23
Ok–1	33	1,459	3,521	2.41	414,000	1,036	284	.71
Pa–1	36	2,845	36,606	12.87	1,398,179	720	491	1.26
SD–1	4	1,267	3,897	3.05	937,000	2,167	740	1.7
Tx–1	14	691	1,715	2.48	346,660	867	502	1.25
Va–1	41	8,114	8,491	1.05	941,369	2,354	116	.29
Wa–1	28	2,386	11,028	4.61	653,106	1,633	274	.69[1]
TOTALS								
1944	509	49,155	$162,943	$3.31	9,694,355	26,694	197	.54
1943	148	15,506	$38,371	$2.47	3,112,880	7,906	200	.51

[1] Cumulative to end of fiscal year 1944.

MICROBIOLOGY AND SOIL CONSERVATION

A conservation system of farming which uses crop residues on the surface of the soil to reduce runoff and erosion. Microorganisms perform their tasks of making plant food available under this plant-residue cover. (After Duley and Russell.)

By T. M. McCALLA

The soil is inherently a complex system composed of physical, chemical, and biological systems in a delicately balanced equilibrium. The bio-organic system is composed of 2 to 4 tons per acre of living plant material above the surface. Below the surface there may be as much as 4 tons per acre of living plant roots, ¼ to ½ tons of living microscopic forms, 30 to 60 tons of dead organic materials composed of the remains of higher plants, and bodies of microorganisms of all types and in all stages of decomposition. The biological system also includes non microscopic insects, rodents, and higher animal forms both living and dead. The bulk of the microbial activity is concentrated in the upper layers of the soil profile, where as many as one billion organisms may be present in a gram of soil. This represents the biological state of living and dead matter in a fertile soil.

The minute organisms, with the exception of a few groups like algae and autotrophic forms, depend upon the higher plants for fixed carbon. The higher plants, on the other hand, depend upon the lower forms to liberate carbon dioxide. The higher plants and the microorganisms are interdependent upon each other for the cyclic oxidation and reduction of carbon.

All of the nitrogen in the soil must be transformed to an available form by microorganisms. More than one-half of the phosphorus in eastern Nebraska soils is in an organic form and may be transformed by soil microorganisms to an inorganic form which is available to plants. Also, a part of the potassium and many other nutrient elements, such as sulfur, pass through the cycle of decomposition and resultant availability to the plant. These activities of the microorganisms are beneficial to the higher plants.

Most of the microscopic forms are competitive with crop plants for inorganic nutrients such as nitrates, oxygen, and moisture. Some of them cause plant diseases. Other living forms, such as insects, prey upon the crop plants. Worms and other animal forms are supported by the soil. Most of the microscopic forms, although competitive for food with the higher plants, play an important role in the release of nutrients from organic matter through decay. The microorganisms synthesize, as well as destroy, such compounds as the vitamins, hormones, and auximones in the soil and in plant material. Although it is not certain that these growth factors are required by higher plants from external sources, they are needed to various degrees by the different groups of microorganisms. During the release of the inorganic ions tied in organic complexes of plant tissue, the soil micro-

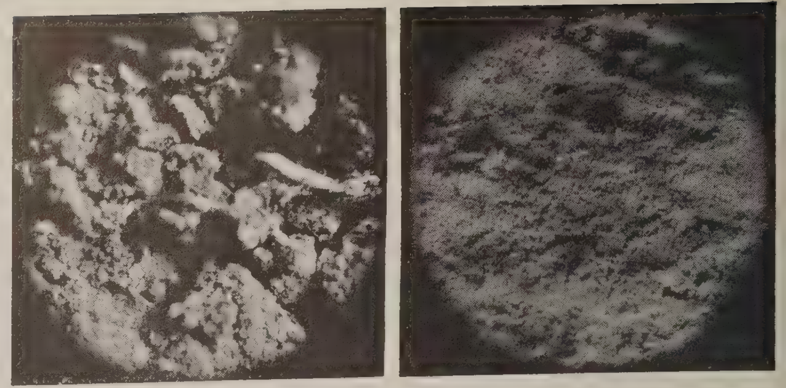
Editor's Note.—The author is bacteriologist, Soil Conservation Service—Research, cooperating with the Nebraska Agricultural Experiment Station, Lincoln, Neb.

organisms liberate metastable decomposition products which are left in the soil to exert an influence on the soil structure. Other products of decomposition, such as carbon dioxide, nitric, sulfuric, and organic acids, act on the soil minerals causing a disintegration of the crystal structure and release the elements for plant use. In some soils, such as podsols, the organic acids developed during decay of plant residues have an important influence on the development of the soil profile. The presence of plant material in many different stages of decay in the soil profile has a pronounced effect on the physical and chemical properties of the soil and also upon the characterization of the soil. Many plants form a mycorrhizal relationship with the microorganisms that range from indispensable relationships with orchids and fungi to plants that derive no especial benefit from the association.

Accelerated erosion has resulted in a more rapid relative removal of the organic constituents than of the inorganic part of the soil. Soil erosion causes a removal of the microorganisms (see table) and organic matter which act as a fertilizer-converting and manufacturing plant as well as its source of material. The runoff water sifts out and leaves the inorganic fraction and takes a good part of the organic substances along to the seas. Soils of low fertility levels have a paucity of organisms. Before legumes will nodulate, lime or phosphorus, or both, and microorganisms, may need to be added to the soil. Raising the level of fertility by the addition of crop residues, manure, or fertilizers will usually result in a return of high microbial activity.

In a conservation program for the farm, all recommended methods of farming should be examined, as stubble mulch is now being evaluated, to determine what effect they are having on the function and performance of the biological system. The questions to be answered are. How do they effect soil structure? How do the practices affect numerous biological activities such as nitrogen fixation, nitrate production, denitrification, and other processes of nutrient production? It is of value to know how rapidly nitrification, for example, will proceed with a given system of soil conservation so that supplemental nitrogen such as inorganic fertilizer, manure, or a legume may be added if needed. It may be important to know the rapidity of conversion of organic phosphorus to a form available to the crop, so as to judge properly the fertilizer needs.

Generally, our farming practices have speeded up microbial activity so that the store of organic matter is dissipated at a more rapid rate than it



Structure in loessial soil. Left: surface soil containing organic matter. When it is protected with plant cover, residues or irrigated, it has a high intake rate. Right: Peorian loess (subsoil) at 10-foot depth, no organic matter. The percolation rate of this soil is low, regardless of whether it is sprinkled or irrigated without the beating action of water drops.

Total number of different organisms in the soil and in the runoff per gram of solid material for all plots, two seasons, the mean of 1935 and 1936. (After Wilson and Schubert.) Determination made by agar plate dilution method.

Number	Soil	Runoff
Ammonifiers	2,185,590	499,169,035
Nitrifiers	7,078	30,642
Sulfur oxidizers	76	2,434
Anaerobes	2,361	70,137
Cellulose bacteria	952	71,131
Legume bacteria	846	101
Fungi	195,333	18,731,810
Algae	3,279	321,335
All organisms	6,949,174	1,836,121,425

accumulates. Control over this type of microbial activity would seem desirable so that our store of organic matter could be conserved against loss by microbial dissipation through mineralization. Since microbial activity is responsive to temperature, moisture, fertility, tillage, aeration, and general management practices, it is possible to control friendly microbial activity by proper methods of tillage, drainage, fertilizers, crop rotation, and legume inoculation. Soil conservation methods should be adjusted so as to work with the natural biological performances in the soil.

During the decay of crop residues soil microorganisms and their products of decomposition play an important role in stabilizing the soil structure to water action. Both organic matter on the surface and in the soil have been found to increase water intake. Any solid organic material on the surface of the soil physically capable of breaking the impact of a falling raindrop will keep the surface from puddling and increase water intake. The organic matter, however, is subject to decay and

remains only until the organisms have broken it down into decomposition products too small to remain at the surface of the soil. Some constituents of organic matter in the soil do not increase soil structure stability under impact of water—it is only certain types of compounds. The lignins, waxes, fats, oils, and proteins were found effective, while cellulose, sugars, and starches did not affect stability. Microbial tissue, especially fungus mycelia, was an effective binder. The aggregate size, arrangement, and stability are important in water percolation. Cropping practices, such as a good rotation that includes a grass-legume sod, help to maintain the soil structure. The stability of the soil may be improved by the addition of manure or the return of crop residues.

Eroded fields may be restored in a considerable degree to their former productivity by the return of legumes to decay and produce nitrates, or by the addition of lime and phosphorus to make conditions more favorable both for the plant and the nitrogen-fixing organisms. Adequate soil fertility maintenance for insuring nodulation of the legume plant is necessary. However, lime and phosphorus application to an eroded soil may also speed up nitrification of the already depleted reserve of soil nitrogen, so that the production of leguminous crops is more essential than ever. The indispensable role of the legume bacteria in nitrogen fixation with legumes is unquestioned. The success of kudzu and numerous other leguminous cover crops in combating erosion is self-evident. Inoculation of legume seeds should be practiced where the soil is deficient in the proper legume bacteria.

Although plants may be grown without microorganisms, the fact remains that microorganisms are present in all soils. No soils are sterile. The most productive lands in this country are soils where the active biological complex is operating. Under these conditions, nutrients are released to the crop through orderly decay. The production of organic matter through plant growth allows the soluble nutrients in the soil to be tied up so they cannot be lost by leaching. The nutrients can be released later to the plants through decay. The growth of cover or green manure crops on bare land prevents erosion and also allows the plants to tie up available and soluble nutrients in organic complexes that can later be released by microorganisms through decay.

Erosion and certain cropping practices are rapidly depleting our fertile soils of their active biological system and the store of organic material upon which it functions. Our knowledge of plant growth and soil fertility is still limited largely to the inorganic phase. We may yet learn of the intricate mechanism in the surface soil—the biological complex functioning in a regulatory fashion. For example, during the winter the bio-organic system does not release nutrients in a soluble form to be leached away. When the weather is warm and conditions are favorable for crop growth, the biological system starts operating at a more rapid rate of nutrient development. This nutrient development may coincide closely with the plant needs, especially in a fertile surface soil. If there is nothing in the soil on which the biological system can operate, the system cannot function. Such a situation might arise in the case of an eroded soil.

It would seem evident that the best soil conservation procedures are needed, not only to conserve the better soils with this biological system, but they must work with it in accordance with natural laws.

Soil conservation appears, then, to be more than merely keeping the physical part of the soil in place. **A sound conservation program must include the best features of all good cultural and cropping practices developed on a firm scientific foundation, including the sound principles of soil microbiology.**

PROFILE—(*Continued from page* 215)
He wrote letters and made contacts. He championed the cause of an effective and democratic district law in Pennsylvania when certain groups in the state had other ideas. And because his wholehearted belief in and eagerness to fight for soil conservation and conservation districts has been tempered by a true tolerance and understanding, he has been willing to work with others whose views have differed from his. The whole soil conservation movement in Pennsylvania has been greatly furthered as a consequence.

Roper is not only chairman of the Lancaster district supervisors, he is also president of the Pennsylvania Land Conservation Association, a statewide organization which is interested in the conservation of natural resources for the general welfare of all the people in the state. In this capacity, he has had a further chance to show his leadership with the supervisors of all six districts in the state and with the whole membership of the Association.

What about his own farm? Somehow Bill Roper has found time to look after that, too. It has become a far different place than it was in 1936; here's one example. He has added 18 acres to the original 122, and has increased his farm's carrying capacity from 12 head of cattle to a herd of 50 purebred Guernseys for which he is noted.

E. Bioren Getze, Jr.

WISCONSIN DISTRICTS CONSIDER POST-WAR PERIOD

By ORRIE SHIFFER

Several weeks ago, I was one of 10 supervisors from about the state having the privilege of meeting here with representatives of the College of Agriculture and Soil Conservation Service. I was selected to represent the districts, to try and present their thoughts, which I believe will represent the thoughts of district supervisors throughout the state.

We read of post-war planning, we talk post-war planning, and I am pleased to state, we are taking action on post-war planning. Through our county boards, post-war plans are being developed. Municipalities are post-war planning. Our soil conservation district governing bodies have been developing post-war plans.

The more one studies the problem of soil erosion and land misuse and mismanagement, the more one realizes the size of the job to be done if we are to stabilize and maintain our soils. Wisconsin's wealth comes primarily from its soil. The welfare of its people, both rural and city, depends much on the way that soil is managed. Soil erosion problems are definitely an important part of all agricultural programs.

In Wisconsin as a whole, on 37 percent, or 3½ million acres of our cropland, soil erosion is a very minor problem. But on the other side of the picture we find that one-third of the cropland, or a little over 3 million acres, has lost about one-third of its original topsoil. On another one-fourth, or 2½ million acres, erosion has taken place to the extent that virtually all of the topsoil is gone. These figures should serve to arouse the interest of everyone in this problem, since we must remember that these tremendous losses have occurred over a very short period of time.

When we speak of soil erosion or soil conservation, we have in mind, of course, topsoil—that thin layer of the earth's surface which is so important for the production of crops and which is the foundation of agriculture. To bring home the importance of the topsoil, some yield tests were made by the Wisconsin Experiment Station and the Soil Conservation Service on selected farms throughout the state. Tests were made under actual farming conditions to determine yields for different depths of topsoil. Two plots were located on a single field so that the cropping history of the plots were identical. The slope of the land and soil type were the same—the only difference being in depth of topsoil. The results of these tests indicated that for about every inch of soil lost, there was a reduction in yield of about 3 bushels of corn and 3 bushels of grain per acre. That is, if one plot had 6 inches less topsoil than its check plot, a reduction in yield of about 20 bushels of both corn and grain resulted. If we were to multiply these yield differences by the topsoil losses, the figures would be startling. I believe that these results should substantiate the fact that we must keep our topsoil at home.

In Wisconsin, we have both water and wind erosion. The seriousness of each type varies in different sections. I believe it is safe to say that most all of the states land now covered by soil conservation districts is subject to water erosion and various sections are menaced by wind erosion, especially where the lighter soils are to be found.

As soil conservation district supervisors, we are gratified at the rapid progress made during the last few years in the conservation of soil and in the development of better land use. Let us consider a program for the future. We have upon several occasions met and talked about post-war planning and the problems involving erosion control which soil conservation districts are confronted with and which would be a worthwhile project for post-war work. It is now time that we at least set down some rather definite problems which exist, what it would take to solve the problem, and in general some proposals as to how such a program should be worked out.

There are many practices which are fundamental in a good soil conservation program, many of which can be done by farmers, either on their own or with technical advice and assistance. Many of these practices are being rapidly adopted by farmers in our districts, and we believe that they will spread at a rapid rate. Such practices as contouring, contour strip cropping, the use of better rotations and other similar ones, are proving their worth, and with a continued educational program and direct assistance to farmers, we feel that eventually most all farmers will accept this part of the program.

EDITOR'S NOTE.—The author is chairman, district supervisors, Eau Claire County (Wis.) Soil Conservation District. This article is a greatly condensed version of an address delivered by Mr. Shiffer at a two-day conference on post-war planning at the College of Agriculture, Madison, Wis.

Now let us think of the problems which have gone unsolved and which are, generally speaking, too big for the individual farmer to undertake. We often refer to these as "community type" problems, since not only the individual farmer, but groups of farmers and the community are affected. Since these are community problems, it seems apparent that the community is obligated to assist to a great extent in the solution. Much could be said about what these problems are and what it would take to bring about proper controls. For the purpose of this report, a few are listed with a few comments in regard to each.

1. *Major gully problems.* The control of large gullies involves the use of equipment, materials and labor which in the majority of cases are beyond the reach of the farmer on whose land the gully exists. In many of the districts, the control of such gullies is the No. 1 job. We believe the control is at least a partial public responsibility and that additional assistance to districts should be provided in order to help farmers on this type of job. These gullies, if not controlled, will not only destroy the land of the owner but will destroy land on other farms, highways, etc. Thus, the loss is to the entire community.

2. *Streambank erosion.* Again we have a large job confronting us, and here again the public is concerned. We need to stress the adoption of soil conservation practices on every acre in the watersheds that contribute to the stream. In both gully erosion and streambank erosion, many highways are involved, as well as other public properties which add to the importance of community action.

3. *Reforestation.* There are many acres of land which will serve the farmer and the nation best only when they are in forest. We therefore should have as an objective, the protection for forest purposes of all lands which are best suited for that purpose. Much labor and some materials are required. It is evident that this job is one which benefits the public and particularly future generations, in many cases to a great extent than it does the individual farmers.

4. *Drainage.* In some districts in the state there is much land of high capability which is poorly drained. This land should be brought into full production. By so doing, other land subject to severe erosion can be conserved and the more intensive cropping done on the other land if properly drained. Here again, most of such drainage jobs require community action. Along with such areas as need drainage we have the rehabilitation of old drainage ditches. Such a program involves ditch construction and tiling, and of course, heavy equipment and labor.

5. *Lime production.* During the past few years tremendous amounts of lime have been applied to our soils. However, a recent report indicates that over the state as a whole there are thousands of acres that have as yet never been limed. Conservation of soil and good crop production are dependent to a great extent on the lime applied to our soils. Therefore, we have the job, through the use of labor and equipment of providing the necessary lime to our farmers.

6. *Stone fences.* In some areas, particularly in eastern Wisconsin, it might be advisable to set up projects to provide assistance to farmers in the rearrangement of stone fences, getting them on the contour. This project would contribute materially to getting away from the old method of farming and allow for the adoption of contour operations. The job of moving stone fences in many cases is beyond the scope of the individual farmer. Equipment, especially, could be used to good advantage in this work.

7. *Water storage and flood control.* We have talked about the control of streambanks and major gullies, but we have, through the western part of the state, an advanced flood hazard. Floods are doing greater damage as time goes on not only on the big rivers but also on our smaller trout streams and small rivers. The tremendous damage done by floods not only to farmland but to towns, highways, railroads, lakes and other public property makes this problem one of vital concern to everyone. Since erosion is one of the prime factors, any soil conservation program should plan for water storage and flood control. Through public assistance to soil conservation districts, reservoirs could be constructed to impound water in the deep gorges in western Wisconsin. Such dams or reservoirs would not only serve as flood control measures but are necessary for the stabilization of eroding streambanks and active gullies.

8. *Sub-marginal land.* Some of the soil conservation districts include much land which is submarginal. The soil will not support a regular farming program. This land should come out of private ownership, developed for forestry or other purposes. Such a program would alleviate the substandard of living, would make a saving in the community as far as roads, schools and other services are concerned, and would allow for proper education and medical care for the people involved. It would remove the conditions which cause this land to become improvished. Soil conservation districts can assist zoning committees along this line and help carry out the program.

ASSISTANCE NEEDED

So much for a program. Now, then, to mention some assistance needed.

The solution to many of the problems outlined requires the use of many types of equipment. Some of the districts have a small amount of equipment made available through the Soil Conservation Service, and a much greater amount could be efficiently used as the program develops and we begin the solution to some of the bigger problems. It is recommended that any available equipment which becomes surplus and which could be used in soil conservation work, be obtained for soil conservation districts. This equipment, if obtained, should be allotted to the various districts as required and as best suited. The following types of equipment, and likely others, would be a primary need in putting across the program proposed:

1. Lime grinding equipment
2. Breaker plows
3. Bulldozers
4. Ditching machinery
5. Draglines and scrapers
6. Terracing equipment
7. Trucks
8. Cement mixers
9. Sod cutters
10. Small tools of various kinds, etc.
11. Cats—tractors
12. Wire

The program contemplated also will require labor, material, and last but not least, financing. We are not so much concerned whether this assistance is from the state or federal government, but it will be needed.

In closing, we feel soil conservation in the post-war era should be considered second only to health and safety.

On a farm near Worland, Wyo., a 5-acre seepy area not suitable for cultivation was diked for muskrat production. Two years later the owner trapped 75 muskrats on the few acres inundated, thus paying for the dike.

There are two general objectives of marsh management—production of furbearers, and production of waterfowl and other wildlife.

Soil conservation is a means of bringing the land and its management into equilibrium with environmental factors.

REVIEWS

TRAMPLING OUT THE VINTAGE. By Joseph A. Cocannouer. University of Oklahoma Press. Norman. 945. $2.75.

Joseph Cocannouer, agriculturist and rural school teacher, has a message. He has nurtured this message deep in his heart for well over forty years, and it is written all over his new book, Trampling Out the Vintage. It is in the title, repeated in every chapter, written in English and American vernacular and quoted from the Chinese, the Dutch, and the Latin. His message is:

"Agriculture is the stabilizer of a nation. We must carry on a persistent, patient fight year after year towards the betterment of farm life, and society, both urban and rural, will have to be reeducated to turn its eyes back to the soil."

You won't be bored by the constant repetition of the theme, because it is woven into autobiographical sketches—tales that are reminiscent of over forty years of agricultural retrogression and progress, stories of life on the farm among the sandhills of Oklahoma, the scrupulously tilled fields of China, and the tropical rice paddies of the Philippines. There is a mixture, a refreshing mixture, of philosophy, folk-lore and superstition, and scientific methodology, with a generous dash of plain American practicality and ingenuity.

Like many another child of the soil, the author admits he grew old ahead of his years. While still very young, he was already analyzing, under the unplanned tutelage of his pioneer mother, the social and economic structure of the dwellers among the sandhills. He knew about the "cotton-thinkers" (those "who can't see a thing but a cotton stalk"), the "movin'-wagon farmers" (gypsy farmers, the riffraff of the cottonminds), and the "fly-by-nighters," who bled the land for all it was worth and then moved on. Much later in life he coined the term "pumpkin-minded," the full import of which will be clear only after reading his chapter on the pumpkin-that-grew-in-the-brambles.

After an apprenticeship in Oklahoma A. and M., Mr. Cocannouer determined to move heaven and earth if necessary to spread his gospel of better living and better farming. His streak of practicality served him well. He inched his way into the outer fringe of acceptance by treating sick cows, feeding unruly calves, and hinting to his Friday afternon "nature study" class about the value of

manure as a fertilizer. But the rural school teacher of the sandhills found his public inert to the new agriculture, and he yielded to the impulse to move on toward greener pastures. It is something to conjecture as to what might have developed had he applied the same pertinacity and ingenuity he used to install a huge hydraulic ram in the deep canyons of the Philippines to ferreting out ways of turning his own homeland into green pastures.

Mr. Cocannouer's down-to-earth reactions will no doubt arouse a sympathetic note in the hearts of other agriculturists and bring a smile to the lips of the budget-pleaders. His words are still heavy with sarcasm when he recalls the emasculation by the English Department of his textbook on corn and the substitution of sprightly, poetry-studded gems for his realistic prose. Then there was the time when he wangled a "suitable" appropriation from a recalcitrant government official by staging a fleeting, but gaudy show, including a feast of lush foreign vegetables in a dilapidated classroom in Manila. And there was the canny way with which he chose, or rather inveigled, the community leaders (those who could and would do the most good for the program) into turning their farms into demonstration projects of the new agriculture.

In his closing chapter, the author again summarizes his case on education for better farming. You may not agree with his prognosis that we still are floundering "despite what would seem to be a sincere effort on the part of the government to find a solution to the problems pertaining to the soil." But he implements his case well when he graphically describes the disillusionment and disappointment of the hill farmers after their soil has washed away to distant rivers, with nothing to rebuild upon except the ashes of neglect.

Verna C. Mohagen.

BENNETT'S SOUTHERN PLATFORM

In announcing Hugh Hammond Bennett as its annual choice for "Man of the Year in Service to Southern Agriculture," the Progressive Farmer recently presented Dr. Bennett's "Southern soil conservation platform" to its readers. This platform runs as follows:

1. *A better Southern farming system* including especially (a) better-planned rotations, (b) less land in row crops, and (c) a better balance between crops and livestock.

2. *Cooperate with Nature and Almighty* by making your crops fit your land and the shape of your land instead of trying to make the land fit your crops. Primarily this means (a) your most level land for row crops, (b) moderately steep slopes for grass and grain, and (c) all very steep slopes kept in trees or grass.

3. *Contour farming* is another form of cooperation necessary to save soils. Straight-line plowing on a sloping country defies Nature and invites disaster.

4. *Grow soil-holding and soil-building crops with or after all soil-robbing crops* with a constant effort to have two-thirds as much green land in winter as summer. The slogan "The South Will Come Into Its Own When Its Fields are Green in Winter" deserves constant emphasis.

5. *Adequate high-quality terracing* with constant emphasis on quality. A poor terrace may do more harm than good. Erosion is just as bad when caused by a terrace break or by too widely spaced terraces as when caused by having no terraces at all. And "Make the Water Walk Off, Not Run Off, the Land" must be constantly preached.

6. *Strip-cropping* to control erosion is newer than terracing but easier to do and should be just as generally practiced on adaptable land-long, gentle slopes.

7. *A vegetative mulch* on the soil-surface is a great help in saving land.

8. *Kudzu, crotalaria, sericea lespedeza and common lespedeza* are "The Big Four" among crops for saving and improving Southern soils—kudzu, among other purposes, to save gullying land, sericea to check sheet erosion, crotalaria to build and hold sandy soils, annual lespedeza to build and hold other soils.

9. *To drain too-wet land* is just as much soil conservation as increasing moisture-holding on too-dry land.

10. *Nearly all soil-conservation work is more effective* if done in cooperation with one's neighbors. Join in activities of your soil conservation district and in boosting erosion control as a No. 1 necessity for all Southern farm progress.

REFERENCE LIST ☆☆

Compiled by William L. Robey, Printing and Distribution Unit

SCS personnel should submit requests on Form SCS-37 in accordance with the instructions on the reverse side of the form. Others should address the office of issue.

SOIL CONSERVATION SERVICE

Progress Report on Design of an Outlet Structure for Head Spillways. (Prepared solely for distribution within the Soil Conservation Service.) Soil Conservation Service, with the cooperation of the Minnesota Agricultural Experiment Station. December 1944. Processed.

OFFICE OF INFORMATION U. S. DEPARTMENT OF AGRICULTURE

Effects of Fire on Gum Yields of Longleaf and Slash Pines. Circular No. 710. Forest Service. September 1944.

Guide for Cutting Allegheny Northern Hardwoods. AIS-3. Forest Service. 1945.

Guide for Cutting Eastern White Pine. AIS-7. Forest Service. 1945.

Guide for Cutting Loblolly Pine of the Eastern Shore. AIS-2. Forest Service. 1945.

Guide for Cutting Oak Forests. AIS-5. Forest Service. 1945.

Guide for Cutting Red Spruce. AIS-6. Forest Service. 1945.

List of Bulletins of the Agricultural Experiment Stations for the Calendar Years 1941 and 1942. Bibliographical Bulletin No. 4. Library. September 1944.

Physical Land Conditions in Clarke County, Georgia. Physical Land Survey No. 35. Soil Conservation Service. 1944.

Report of the Administrator of the Rural Electrification Administration, 1944.

Report on The Agricultural Experiment Stations, 1944. Office of Experiment Stations, Agricultural Research Administration. 20c.[1]

Report of the Chief of the Agricultural Adjustment Agency, 1944. War Food Administration.

Report of the Chief of the Bureau of Agricultural Economics, Fiscal Years 1943-44.

Report of the Chief of the Bureau of Agricultural and Industrial Chemistry, Agricultural Research Administration, 1944.

Report of the Chief of the Bureau of Animal Industry, Agricultural Research Administration, 1944.

Report of the Chief of the Bureau of Dairy Industry, Agricultural Research Administration, 1944.

Report of the Chief of the Bureau of Entomology and Plant Quarantine, Agricultural Research Administration, 1944.

Report of the Chief of the Bureau of Plant Industry, Soils, and Agricultural Engineering, Agricultural Research Administration, 1944.

Report of the Chief of the Bureau of Human Nutrition and Home Economics, Agricultural Research Administration, 1944. 5c.[1]

Report of the Chief of the Forest Service, 1944. 10c.[1]

Report of the Chief of the Soil Conservation Service, 1944—July 1, 1943 through June 30, 1944.

Report of the Secretary of Agriculture, 1944. 30c.[1]

Sphagnum Moss for Seed Germination. Leaflet No. 243. Bureau of Plant Industry, Soils, and Agricultural Engineering, Agricultural Research Administration. November 1944. 5c.[1]

Stumpage and Log Prices for the Calendar Year, 1943. Statistical Bulletin No. 80. Forest Service. January 1945. 20c.[1]

[1] From Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.

STATE BULLETINS

Current Farm Economics in Oklahoma. Vol. 17, No. 6. Agricultural Experiment Station, Oklahoma A. & M. College, Stillwater, Okla. December 1944.

Indiana: The Land and the People. Bulletin No. 496. Agricultural Experiment Station, Purdue University, Lafayette, Indiana. July 1944.

Inspection and Analysis of Commercial Fertilizers. Bulletin No. 353. Agricultural Experiment Station, Clemson Agricultural College, Clemson, South Carolina. December 1944.

Inspection of Commercial Fertilizers. Circular No. 299. Agricultural Experiment Station, Purdue University, Lafayette, Indiana. May 1944.

Program and Work Plan for the Canadian River Soil Conservation District, Tucumcari, New Mexico. The District Board of Supervisors, Tucumcari, N. M. January 1945.

The Quarterly Bulletin. Volume 27, Number 2. Agricultural Experiment Station, Michigan State College, East Lansing, Mich. November 1944.

Science Points the Way. Bulletin No. 453. Fifty-Sixth Annual Report of the Agricultural Experiment Station, University of Arkansas, Fayetteville, Ark. December 1944.

Science Solves Farm Problems and Aids Agricultural Production. Fifty-Sixth Annual Report of the Purdue University Agricultural Experiment Station for the Year Ending June 30, 1943. Lafayette, Indiana.

Seed Treatments. Circular No. 69 (Revision of Circular 56). Agricultural Experiment Station, North Dakota Agricultural College, Fargo, N. Dak. March 1944.

Soil Reaction (pH). Press Bulletin No. 606. Agricultural Experiment Station, University of Florida, Gainesville, Fla. December 1944.

Some Post-War Problems, Policies and Procedures for Indiana Agriculture. Bulletin No. 497. Agricultural Experiment Station, Purdue University, Lafayette, Indiana. September 1944.

Studies on Seed Treatments for Cereal Crops. Bulletin No. 331. Agricultural Experiment Station, State College Station, Fargo, North Dakota. 1944.

Sweet Potato Production: Fertilization and Hill Spacing Studies. Bulletin No. 402. Agricultural Experiment Station, State College, Mississippi. 1944.

Tests of Four Nitrogen-Carriers in a Mature Apple Orchard at Martinsburg, West Virginia. Bulletin No. 315. Agricultural Experiment Station, West Virginia University, Morgantown, W. Va. July 1944.

Texas Farm Land Market Activity: Third Quarter, 1944. 916 Progress Report. Agricultural Experiment Station, Texas A. & M. College, College Station, Texas, with the cooperation of the Bureau of Agricultural Economics, U. S. Department of Agriculture. December 1944.

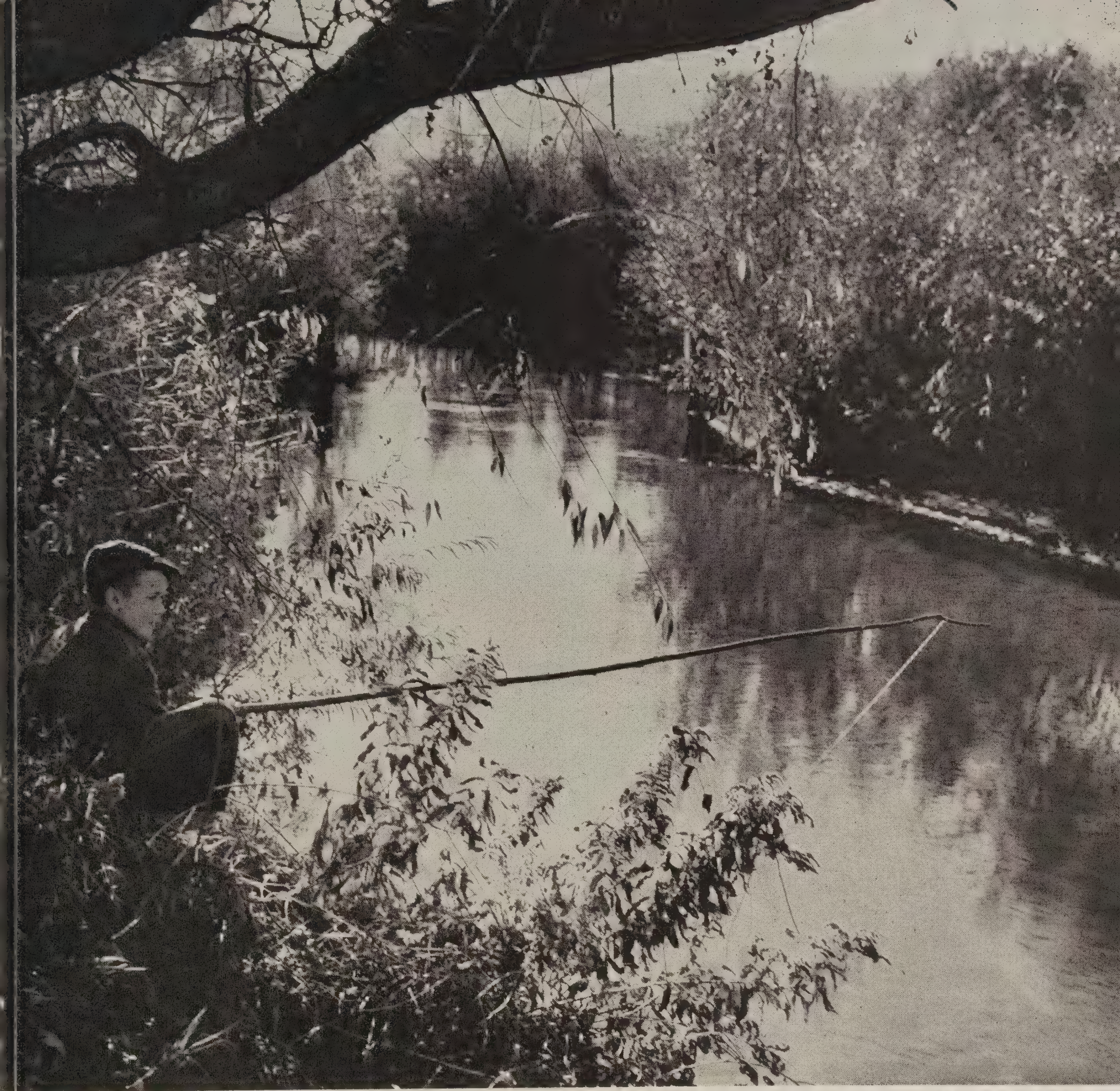
Timely Economic Information for Washington Farmers. Number 49. Agricultural Experiment Station and Agricultural Extension Service, State College of Washington, Pullman, Wash. January 1945.

Treat Peanut Seed for Better Stands. Press Bulletin No. 610. Agricultural Experiment Station, University of Florida, Gainesville, Fla. January 1945.

Varieties of Winter Wheat for Nebraska. Bulletin No. 367. Agricultural Experiment Station, Lincoln, Nebraska. 1944.

Why Some New York Farms Changed in Size from 1941 to 1943. A. E. 489. Agricultural Experiment Station, Cornell University, Ithaca, New York. 1944.

☆ U. S. GOVERNMENT PRINTING OFFICE: 1945—634357



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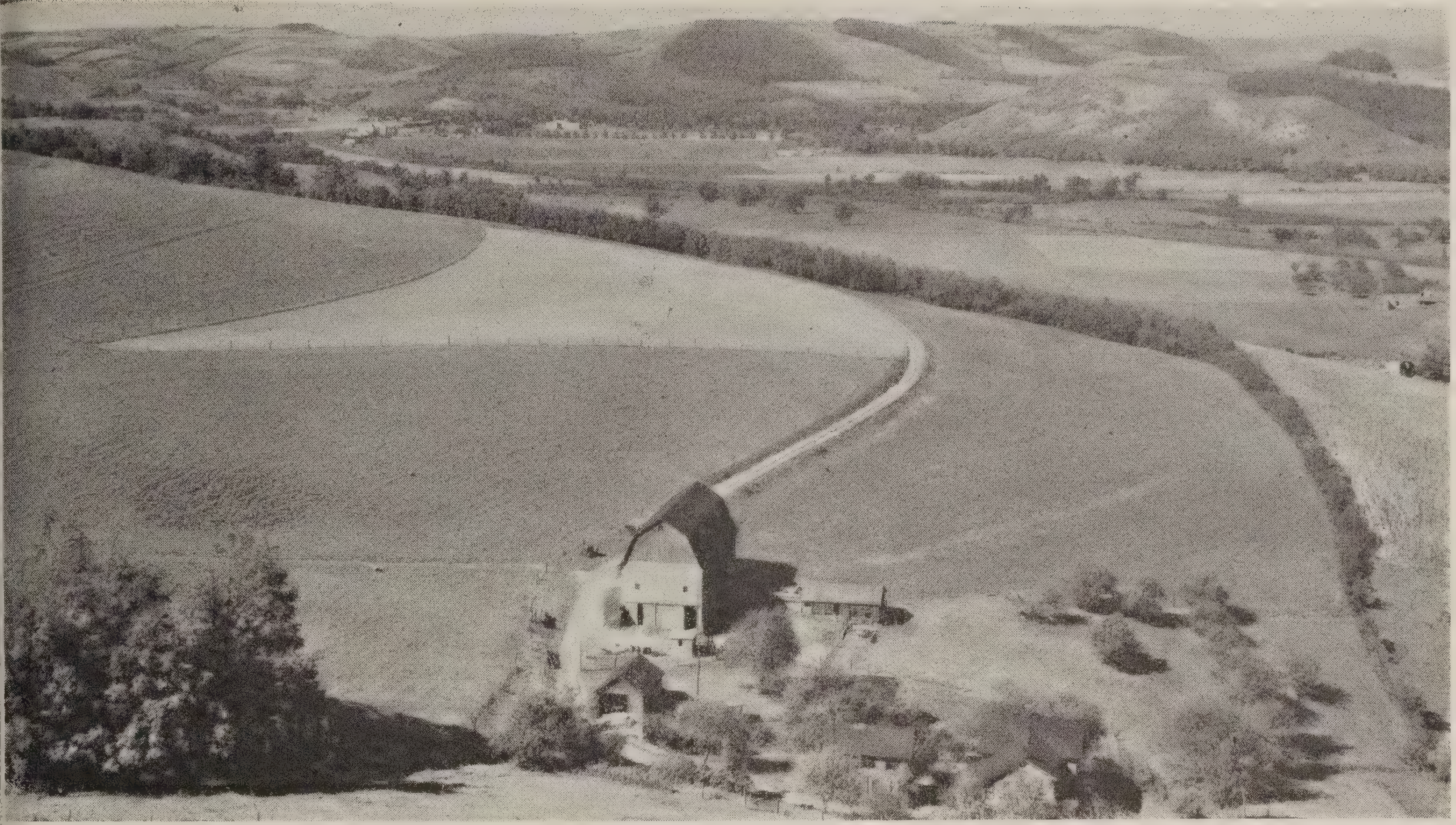
WELLINGTON BRINK EDITOR

CONTENTS

Front Cover: Wallace Moilien fishing in famed Coon Creek, Coon Valley, Wis. Banks vegetated by the Soil Conservation Service. This is a scene from the Service motion picture "The Heritage We Guard." Photographer: William R. Van Dersal.

SOIL CONSERVATION *is issued monthly by* SOIL CONSERVATION SERVICE of the United States Department of Agriculture, Washington, D. C. The matter contained herein is published by direction of the Secretary of Agriculture as administrative information required for proper transaction of the public business, with the approval of the Director of the Budget. SOIL CONSERVATION seeks to supply to workers of the Department of Agriculture engaged in soil conservation activities, information of special help to them in the performance of their duties. Copies may be obtained from the Superintendent of Documents, Government Printing Office, Washington 25, D. C., 10 cents a copy, or by subscription at the rate of $1.00 per year, domestic; $1.50 per year, foreign. Postage stamps, will not be accepted in payment.



"Land capability information is a reliable guide." This New York farm is being operated in harmony with Nature. The returning veteran will find many examples of how productive soils may be safeguarded for himself and his children.

SOIL CONSERVATION DISTRICTS AND RETURNING VETERANS

By MELVILLE H. COHEE

The land resources of our country have played a vital role in the war effort. They will play an equally important part in the peace to come. The returning veteran will have a large stake in what happens to our land.

The most vital institution for the conservation of soil and soil resources is the soil conservation district. Soil conservation districts—about 1,250 of them today—have a strong bearing on the future of veterans. The reason is simple: Under local farmer control, the districts have developed dynamic, long-time programs for conserving soil and water resources. At the same time, district programs are making it possible for farmers and ranchers to obtain larger yields under conditions compatible with physical land resources and the economic opportunities of the moment.

District governing bodies pool their practical knowledge and experiences with the technical and research information of well-trained soil conservationists. Out of this emerge agricultural programs for local areas and watersheds within the districts, which surpass anything else of the sort that has developed in rural America during this century. The proof of such a sweeping statement is in the daily happenings on the some 3,200,000 farms and ranches within soil conservation districts.

Our armed services are today battling for just such democratic institutions as the soil conservation district. For the district is a democratic form of government—a local unit of government. Men who have been associated with soil and water conservation work as carried out through districts, and who are now in the army, the navy, and other branches of the military, write back that they want to see every effort made to keep the districts moving ahead. They want to keep them going now because of the war needs demanding in-

Editor's Note.—The author is Chief, project plans division, Soil Conservation Service, Washington, D. C. For a discussion of soil conservation districts and their operation, see "Self-Governing Principles of Soil Conservation Districts," by Mr. Cohee, in *Soil Conservation*, December 1940.

Soil conservation districts will assist the veteran-farmer in the instalation of needed practices.

creased food and fiber, but above that because of what they mean to the future of our country.

Today about one-half of the farms and ranches of America are within soil conservation districts. By 1950 it is quite possible that the bulk of all our good farm and ranch lands will be within districts. Many a returning veteran who goes directly into farming or ranching will find his land within either an existing or a soon-to-be-organized district. Still other veterans who go into industries will be affected materially, though indirectly, by what happens in the districts. As just one example, consider the man who will help to manufacture tractors, graders, and other dirt-moving equipment—items needed on an increasing scale because of the increased activities in conservation districts.

Let's look at the case of the veteran who prefers to go into farming or ranching for his livelihood, looking forward not only to economic security but to an environment favorable to bringing up his family. In this connection, it is appropriate to view the special responsibility of the district to the veteran, as well as to examine the opportunities which might normally be expected from district operations.

A sample inquiry made last summer of men in the army indicates that about one man in ten will leave the army definitely expecting to farm. Based upon this and other considerations, it has been estimated that of the number of men in the armed services, between 900,000 and 1,000,000 will seek farms and farm employment. Of these, the survey shows, as many as 250,000 to 300,000 men do not have definite locations or farms in mind. An equal number know farms they think of renting or buying, but are not sure about.

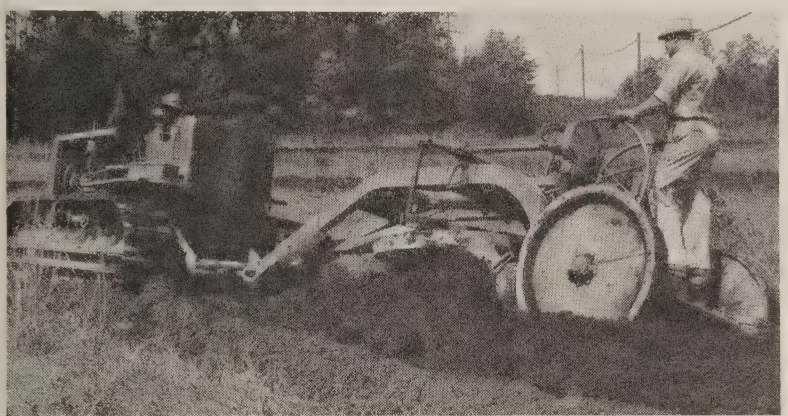
This young man just back from the war may settle on a farm already owned or operated by members of his family. But more often it will be a farm about which he has little or no previous detailed knowledge. Suppose we examine both types of cases with regard to what the district has to offer the veteran:

1. The prospective farmer wants to know about the land in different parts of the community under consideration for his future home and business—the farm. Most districts have good information on the use capabilities of all land in the district. This means that soil types, degree of erosion, slopes and other physical characteristics of the different parts of the district are known in some detail. Lands in the same local area differ. Some are good for one use, others for quite a different use, and still others may be suitable for numbers of purposes. Land capability information is a reliable guide.

Furthermore, the governing body, usually known as district supervisors, has delineated the district into various sub-areas according to the

seriousness of soil and water conservation problems as a whole. The returning veteran, or prospective farmer, should take all these things into account in sizing up the quality of land in the different parts of his would-be future community. As a matter of fact, he may buy or rent a farm in a part of the district that is not the best so far as productivity and ease in the maintenance of soil fertility are concerned, because the purchase price or rental arrangements are favorable. Guidance, information and advice from district supervisors can go far toward insuring a square deal.

2. Information about land capabilities not only will offer a guide to the relative merits of different parts of the district, but will afford basic facts as to what specific uses should be made of the land. The suitability of the land for crops, pasture or



"Hundreds of pieces of heavy earth-moving equipment will be needed . . ."

woodlands is readily known through study of such information. Furthermore, the degree of intensity of use of the cropland and its probable production capacity can be established. Some lands can be in row crops more often in a given period of years than others. With prescribed soil and water conservation practices, however, this situation may be somewhat modified. The district has recommendations for each use capability category and the veteran can judge for himself what it will take to keep the land productive and at the same time grow crops suitable to the type of farming adaptable in the community.

The prospective veteran-farmer may have a definite preference as to the type of farming he prefers. He may seek dairying. He may want, for example, to be a corn-hog farmer, or to specialize in beef cattle, or sheep. It is equally essential to have this information about the land if he wants to operate a general or diversified type of farming business. In many, many cases, the serious erosion problems on the land or the low farm family incomes for the year's labor result because the type of farming being carried on is not in harmony with the various capabilities of the land making up the farm itself. District supervisors can help the returning veteran to avoid these pitfalls.

The agricultural extension agent of the county, along with other professional agricultural workers, can give the veteran much information on livestock, equipment, farm labor, and a host of other needed matters bearing on the final selection of the farm. Needed facts on purchase contract, settlement or rental arrangements can be supplied from the same source. A veteran's advisory committee has been established in virtually all counties of the Nation for providing general advice to agriculturally inclined veterans. Furthermore, the Veterans Administration has designated these committees as a local point of contact for veterans desiring advice prior to applying for a farm loan guaranty under the Servicemen's Readjustment Act of 1944. It can not be emphasized too much, however, that the physical aspects of the land are extremely important, and the soil conservation district can make a valuable contribution to the returning veteran in this direction.

3. Not only is it important to get the right farm, suitable to the desires and aptitudes of the veteran, but also to maintain that farm in the most productive state year after year. There is rarely a farm that does not need some soil and water conservation practices. Whether few or many practices are needed, the soil conservation district stands ready to serve the owner and operator. Assume the district has helped the soldier, or sailor, or merchant marine, as the case may be, in the selection of his farm, is it not going to help him take care of it? Even if it did not help him in the selection, the district stands ready to assist with conservation problems.

What can the district do for the veteran on conservation? Among other things, it can furnish him (a) a map of his farm showing the land capabilities of each acre, (b) recommendations as to proper land use—crops, grazing land, woodlands, and so on, (c) technical services on the farm in connection with determination of specific need for and location of different soil and water conservation practices, such as, terraces, strip-crops, drainage, management of irrigation water, grazing management, farm woodland planting, management and harvest-cutting; and the use of odd areas for wildlife and the development of farm ponds, looking toward future hunting, trapping, and fishing for the veteran and his family. Furthermore, as the veteran-farmer installs such practices the district will provide the services of a technically

trained soil conservationist to help in their installation. Maintenance of practices is important, and the district can help on this too.

All this is for the veteran who will take up farming or ranching as a livelihood. Second, let's see what the district can offer the veteran who does not care to become a farmer. For the man who has been handling equipment in the armed services, there's comparable work in the districts. There is need for terraces or diversion ditches on nearly 100 million acres. Many farmers will prefer to do this work themselves, using their own equipment. However, many prefer to hire it done because their own equipment is not adequate or already is serving to its full capacity on other farm tasks. The veteran who obtains the needed equipment can contract with the district or with individual farmers to do terracing and diversion work. He might even have several units of equipment constantly busy on this type of work in a single district—a full time occupation. If he farms some for himself, he might arrange to do a sizeable amount of custom work for his neighbors.

This same field of opportunity exists in connection with many other soil and water conservation practices. Let's look at some of the conservation practice needs: soil saving dams—376,000; development of stockwater facilities (springs, farm ponds, and the like)—1,200,000; drainage for around 30,000,000 acres, approximately two-thirds of which involves the repair and rehabilitation of existing drainage systems; streambank erosion control on nearly 1 million acres along creeks and rivers; improvement of farm irrigation systems on over 11,000,000 acres; small and large structures to control or heal thousands of gullies in fields and grazing areas. **Hundreds of pieces of heavy earth-moving equipment will be needed to get the conservation practices carried out. Even where conservation districts themselves may own equipment, they will need skilled operators. The veteran who can not or does not choose to own equipment, may find gainful and steady employment in operating and maintaining this equipment.**

The soil conservation district programs are, by no means, exclusively of a mechanical or structural nature. In fact, in a majority of cases the conservation measures essentially involve vegetation. It is entirely reasonable to assume that the returning veteran may wish to get in on these. He may wish to enter the seed business. Thousands of pounds of grass and legume seed are now being used each year that were not used before, in order to have the right soil and water conservation practices. Likewise, there is an opportunity in the production of woody type plants—the nursery business. Much of our present cropland, in fact more than 40 million acres, should be retired to pasture or woodland use. This means a big demand for seed and nursery planting stock.

What about the veteran who chooses to embrace the public service? Soil conservation is one of the newest of all applied agricultural sciences. A comprehensive, scientific, action effort has been going on for at least a dozen years, and will undoubtedly expand after the war. The basic, guiding principle can be stated as follows: Effective prevention and control of soil erosion and adequate conservation of rainfall in a field, on a farm or ranch, over a watershed, or on any other unit or parcel of land, requires the use and treatment of all the various kinds of land comprising that area in accordance with the individual needs and adaptabilities of each different area having any important extent. **Such a promising field, drawing heavily on manpower and other resources, offers a professional life work for many of the men now in the armed services.**

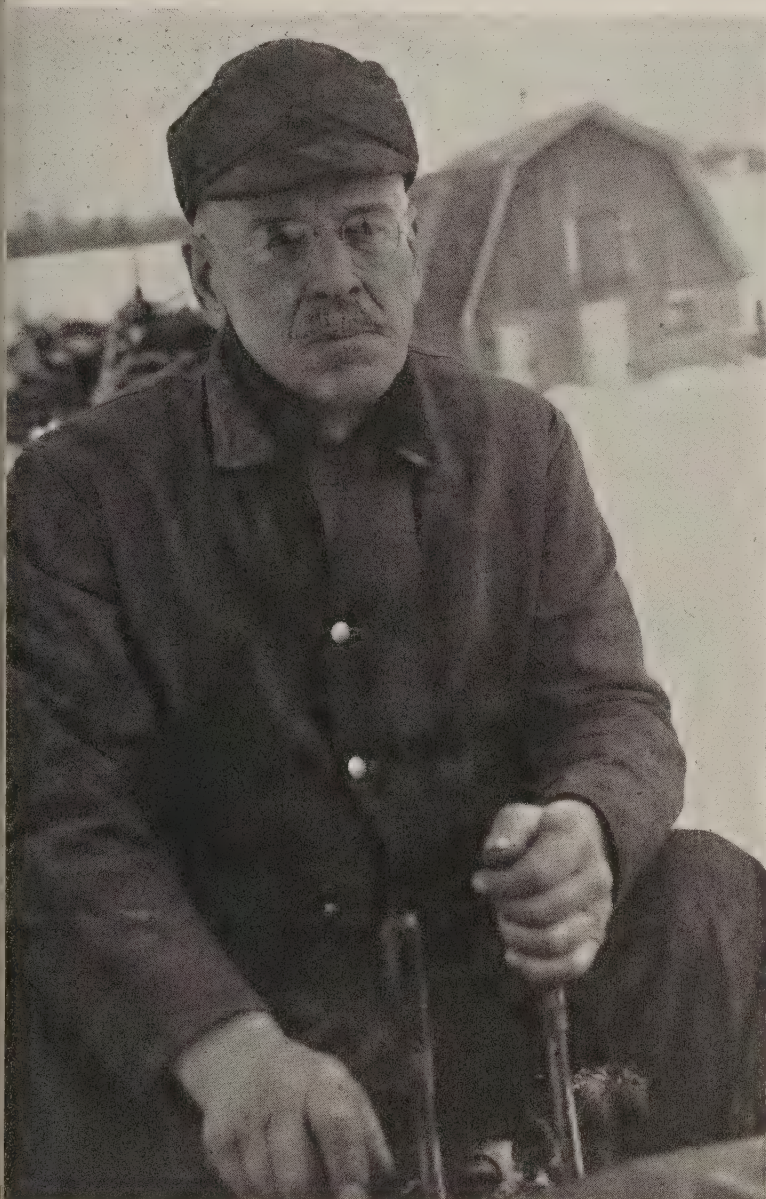
Farmers generally, and especially soil conservation district governing bodies, realize that the installation and maintenance of many soil and water conservation measures pose problems somewhat more complex than they can handle alone. Farmers cannot be expected to solve all their erosion-conservation problems without professional assistance. And right now there is a shortage of qualified soil conservation technicians.

Returning veterans will offer one of the most fruitful groups from which to recruit and train new, qualified technicians. By the second year after the war is won probably 3,000 new men in this field of work can be employed and trained. Each year thereafter, the Soil Conservation Service could absorb an additional 1,500. By the twelfth year, at such a rate, there would be 20,000 trained technicians on the job. Related fields of endeavor in research, education, and vocational teaching will undoubtedly call for expansion, and here again are opportunities for returning veterans.

Soil conservation districts, through which much of the needed soil and water conservation work in our Nation will be carried out, require the services of returning veterans. The science of soil conservation can be furthered by veterans. Thousands of returning veterans, in turn, will have their futures benefited one way or another by the conservation of soil and soil resources and the prevention and control of soil erosion.

DISTRICT PROFILE

MEET JIM SKINNER OF MICHIGAN



Jim Skinner is a hard-fisted, gruff-voiced Michigander whose 69 years of farm experience have made him a champion of the farmer's cause. That's why the directors of the Fenton Soil Conservation District in northeast Livingston County, Mich., have elected him their chairman five years in a row. **He hasn't missed a single meeting in those five years.**

How did he get started in district work? Let Jim tell you.

"One spring I planted corn three times on the steepest field on the farm and the doggoned rains washed it out every time. I had heard about the Fenton erosion control demonstration project, so I says to two of my neighbors, 'Let's go over to see those boys and get some help.'

"They told me I was outside the project boundaries. But I was stumped, and something had to be done. We went to the county agent, and he sent us to the project man. The project man started to send us back to the county agent—that's where I balked.

"We had them send some state men down here, and we thumped some heads together to get action. 'The state men admitted that Jim was a little rough, but they were just as anxious as he to see the farmers take action.' So we got a district in here, and it's one of the greatest things that's happened to our community."

Skinner is a big man, standing six feet two and a half, with broad shoulders, long arms, and big hands. After you talk with him, you're sure he has a big heart. Some say his tongue can be as sharp as a Michigan wind in winter, but his sincerity and friendly smile are warming. When asked about his nationality, Jim says, "I'm gen-u-ine American," which he certainly is. His speech, however, has a slight tang of old Scotland.

A graduate of Michigan State College in 1901, Skinner became one of the nation's farm institute county agents (Kent County, Mich.) in 1912. He was a state farm institute leader for 6 years, managed a number of farms including a several thousand-acre ranch in Montana, and for the last 15 years has operated a 690-acre farm owned by newspaperman H. S. Booth.

During the war he and one other man are doing all the work on the farm. They can do it because the inventive Skinner has rigged up a lot of labor-saving and time-saving devices in his own farm shop. His one son, Pfc. Joseph Skinner, is a real G.I. Joe with the infantry in Texas. Jim hopes he returns to the farm after the war.

Jim's greatest pride is the work of the soil conservation district. He calls farmers in the district "stockholders," and in carrying out soil conservation practices they are building up their "reserve assets."

It was his idea that the 1943 and 1944 annual reports should carry a "table of values" of work done. That table for 1944 evaluates soil conservation work completed during the year by 200 co-

(*Continued on page* 254)

Three-year-old pasture first season after reworking.

A Business Man Looks at Part-Time Farming

By R. E. BELL

As Told to J. A. Johnson

It is natural for a business or professional man or skilled worker to turn to the land. He also is a land creature. He never frees himself of dependence on the land no matter how he surrounds himself with concrete and steel structures or modern gadgets. He is fed by the land, clothed by it, and usually sheltered by it. He seldom if ever loses his yearning for direct, successful contact with the soil. This inherent desire frequently becomes strongest when he has achieved success in business, profession, or occupation, and has some leisure time on his hands. Then he may buy a farm as an investment or hobby.

Too often, however, the farm proves to be neither a good investment nor a satisfactory avocation. It may be a drain on other earnings, and its recreational value largely lost. Frequently this is due to improper land use and soil erosion.

EDITOR'S NOTE.—Mr. Bell is a business man and part-time farmer of Mendenhall, Miss. Mr. Johnson is district conservationist, Soil Conservation Service, Mendenhall.

Wild winter peas build soil and furnish cheap winter grazing on the author's farm.

The wild winter peas also produce a seed crop. This 9-acre field made 1,800 pounds of seed the first year, after being grazed about four months.

As a nation we are realizing that many tenants and landlords, including the business or professional man or the skilled worker who owns land, actually have been miners rather than farmers. Although business and professional men, and sometimes skilled workers, usually are more able to withstand losses than the average farmer, there is no more reason for them to use shortsighted and wasteful farming methods than to use shortsighted and wasteful merchandising or working methods.

Much is said these days about a future type of part-time farming. Post-war planners assert that many semi-skilled factory and office workers must keep "one foot on the land" in the America of tomorrow. They advise this group to live on small farms while working in nearby factories or offices. This, they say, will relieve housing short-

Treated fence posts from thinnings in young pine stands. The author figures his fencing problems will be solved if these posts last 10 years.

ages and provide additional income and healthful living conditions.

But of all farmers, the part-time farmer can least afford soil erosion and low yields. I feel keenly on the subject of soil conservation, because what I have learned during the past two years about sound conservation methods seems equally applicable and essential to the full-time and the part-time farmer.

Several years ago I bought a local business establishment, borrowing most of the money for the transaction. It required several years of slavish work to meet payments and keep the business growing. These years emphasized the importance of making each department carry some measure of the load in order that one might not fail and endanger the whole. The smaller the business and the operational margin, the truer is this fact. And so it is, it seems to me, with part-time farming. Each acre, each crop, each undertaking should carry much of its own burden, because a small amount of dead weight can soon drag a small farm under.

This fact was proved, in my case, when I began to find some leisure. I owned three plots of land, and it was natural that farming should claim my attention.

One plot of 11 acres provided a home site, a pasture for milk cows, and a small garden.

Another, a farm of 153 acres, provided a place to run native cattle obtained through business trades. Much of the farm was woodland, heavily cut over by former owners. The cattle roamed the woods and I tried to grow winter feeds on three small fields and on some rented land. I grew oats and corn for grain, and soybeans for hay. The oats did fairly well, but the corn and soybeans were poor. Each winter I found the cattle in fair condition, but with a short feed supply and little prospect for winter grazing. Many cattle died or were sold at a loss. The third tract consisted of cutover longleaf pine land which has since been sold and the money invested in land more suitable to my needs.

I was willing for a while to charge losses to recreation, but I saw that this could not be continued.

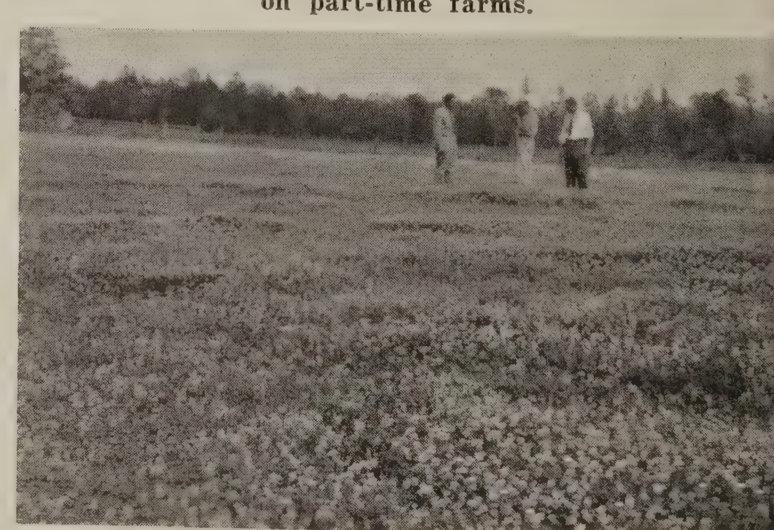
Two years ago I started a fish pond on the 11-acre home place. Needing advice on new construction and management techniques, I went to the Simpson County Soil Conservation District office. I was not a district cooperator but the local Soil Conservation Service technicians helped several afternoons after work. Their suggestions proved worth while, so I requested assistance on the 153-acre farm, and helped to organize my neighbors into a conservation group in order to obtain assistance.

A conservation plan was written for the place on December 11, 1943. The technician convinced me that the farm should be developed as pasture, for winter grazing crops, and as woodland, because it was better suited for these uses than for row crops. He suggested also that the rented land be planted to grain and hay crops.

During the first year (the technicians helped me get some of the work started before the plan was written) about 20 acres were planted with white Dutch clover, Dallis grass, and annual lespedeza for permanent pasture. Nine acres of wild winter peas were planted for winter grazing. About six acres were planted to oats and crimson clover for winter grazing; seeded later to white Dutch clover and annual lespedeza for permanent grazing. These new pastures and grazing crops carried cattle through the first winter with little loss. Twelve native cows and calves were sold in the spring of 1944, and the money was put into registered and grade Herefords. The entire herd entered this winter season in excellent condition. In addition, 900 pounds of white Dutch clover seed and 1,800 pounds of wild winter pea seed were harvested from these pastures and fields the same spring.

Poor quality trees in the cut-over woodlands offered poor post materials for fence repair and construction. At the suggestion of district personnel, young pine stands were thinned enough to yield about 100 peeled posts. These were chemically treated and have been tested in fence lines for about a year. Some 1,500 posts are being treated now as they are obtained from thinnings and the cleaning of pasture.

First-year pasture. Only top-notch pastures are economical on part-time farms.



Pasture development for erosion control around the fish pond at the home place increased grazing to such an extent that two milk cows could not keep up with it so now I often put newly purchased beef cows there for observation and to give them a boost.

This is only a start, but progress has been gratifying all the way along. The most startling results came in 1944 on the rented land where conservation methods also were used. This plot consists of about 48 acres of fair bottom land. Oats were seeded the preceding fall on 34 acres and overseeded in the spring with Kobe lespedeza. More than 1,000 bushels of oats were combined from this part of the field. I put up 500 bales of oat straw for bedding from a light raking where I planned on saving lespedeza hay. I saved 1,200 bales of excellent hay, leaving 6 acres of lespedeza to mature. More than 3,000 pounds of combine-run seed were harvested from the 6 acres in the fall. The rest of the field was in corn, which did well to yield 10 bushels per acre. The corn land, by the way, received more fertilizer and more work in proportion, than did the rest of the field.

Since seeing these results I have bought a fourth plot of 303 acres. A conservation plan will be written for it shortly. If these soils are suited to oats and corn for grain, annual and perennial hays and seed crops in rotation, then I shall have no further need for the rented land.

If conservation methods can turn second-rate fields into pastures which hang solid meat on rugged frames; if good management can improve abused woodlands and provide good posts from worthless stock; if conservation practices can cause four crops to grow where one low-yielding crop grew before—improving the land rather than depleting it—then these economic advantages alone seem ample recompense. But when I add recreational advantages derived from pleasant work and the wholesome sports of fishing and hunting on my own land, when I consider the energizing effects of clean, unharassed, outdoor work; when I experience the moral uplift derived from pleasing contact with the land, the total, to my way of thinking, is satisfying to the highest degree.

The conservation principles underlying what I have done on my own land have been applied extensively during the past years by many full-time farmers, especially where assistance from soil conservation districts is available. It is true that it sometimes takes several years for a full-time farmer to put a complete soil conservation program into effect because of limited resources. But plans made with help from district technicians are developed so they may be carried out in five years, and if more time is needed, district assistance can be extended. Those part-time farmers who have fewer resources than active business men-farmers may find that several years are required to establish conservation practices; but all such farmers must use these methods if they are to avoid failure.

Failure, even indifferent success, quickly robs part-time farmers of every return the land offers —economic, physical, and spiritual. Soon they become doubtful, then fearful, then thoroughly beaten and disgusted. I know from experience that a part-time farmer can lose his feel for the land, vowing to turn his back upon it.

Successful part-time farmers, however, obtain benefit from profitable operations, no matter how large or how small. They receive satisfaction from anticipation of additional present and future security. Seasonal monetary returns reinforce their fortitude as well as their pocketbooks. Part-time farming may be an excellent substitute for costly sports. Last but not least, it broadens spiritual life through its satisfying contact with the earth. Successful farming is a moral stabilizer.

There is truth in the proposition that part-time farming has post-war potentialities. But I am convinced that these can be realized only where conservation methods are used. It is foolish to suppose that conservation farming guarantees complete success, but it can provide insurance against complete failure. My thesis is this: Every agricultural organization, group or agency, and every manufacturer, banker and merchant, and every minister of the gospel, should help to anticipate and solve the problems peculiar to part-time farming. A definite cooperative program may save many part-time farmers from ruin or the withering disappointment that ensues from failure.

Planning *now* is needed to save thousands of acres of land from mismanagement and possible destruction. It seems to me that soil conservation district supervisors and the personnel of the Soil Conservation Service have a heavy responsibility here, and that the rural life movement ought not to overlook this opportunity to safeguard both soils and souls.

It is conceded that *all* farming should be conservation farming. In my opinion, part-time farmers owe it to themselves to take advantage of all available technical assistance. The sooner this is done, the better for the farmer himself, the land he works, and the community of which he is a part.

Lehmann lovegrass.

Arizona's Wonder Grass

By ROBERT V. BOYLE

Most of us have read John Ingalls' "Grass." It's a masterpiece of writing. Aside from vividly pointing out how important grass is, it makes the fellow who doesn't have any feel bad. Arizona, though, has an "up and coming" grass that is a wonder. In a few years, practically anyone in the recognized ranching areas of southern Arizona can have grass.

Lehmann lovegrass is an introduction, like filaree, except that filaree got here by accident, and bringing the grass in was premeditated. This grass is to the hot and semi-arid part of Arizona what crested wheatgrass (introduced from Siberia) is to Utah, Colorado and other states north and east of us. **As a downright valuable forage grass and as a plant to hold the soil, Lehmann lovegrass is bound to be recognized more and more in the next few years. For these purposes, the South has kudzu, lespedeza, Rhodes grass, and the well-known Bermuda. It is fortunate that Arizona, too, has its wonder grass.**

A small amount of seed of Lehmann lovegrass was obtained from the Union of South Africa through the Division of Plant Exploration and Introduction of the Bureau of Plant Industry. First plantings were made under irrigation on the Soil Conservation Service nursery at Tucson in 1934. These initial trials were so promising that larger seed-increase plantings were established in 1935 and succeeding years, and good crops of seed have been harvested each year. Adaptation trials have been made on representative range areas throughout the Southwest. It has been found that the grass dislikes cold winters and thrives only in a

Editor's Note.—The author is regional chief of operations, Soil Conservation Service, Albuquerque, N. M.

Contour planting of Lehmann lovegrass in Southern Arizona.

mild climate where the temperature seldom gets below 15 Fahrenheit.

The accompanying picture gives an indication of the general appearance of the plant. It produces a luxuriant growth of leafage and seed. Cattle don't like it quite so well as grama when the latter is green. However, it greens up earlier and stays green longer than does grama, and therefore fits well into the picture. When growing along with browse, Lehmann lovegrass is relished by cattle and horses. It ranks along with grama and other common grasses as far as nutritive value is concerned.

The chief virtues of Lehmann lovegrass are: (1) *Ease of establishment* It can be planted successfully where native grasses either fail to come up or are "rubbed out" by adverse conditions. (2) *It isn't choosy about soils.* It seems to do about as well in sandy soil as adobe soil; rocky ground as alluvial valley. (3) *It is drought-resistant.* Even small seedlings pull through dry spells when native grass seedlings curl up and quit the game. (4) *It reproduces well.* Millions of viable seed are produced which can and do result in a fairly rapid spread. (5) *It stays green over a longer period of time than do the native grasses.*

These statements aren't made solely on the basis of the adaptation trial plantings mentioned above. This grass has passed even the field trial stage. Several years ago it was planted on 10 or 15 acres of slick bare ground at a windmill on the Babacomari grant belonging to Frank Brophy. It is definitely still there, doing well, spreading and being eaten. On the new highway between Benson and Willcox, Lehmann lovegrass is "taking over" the right-of-way. On Rancho Sacatal, near Douglas, W. E. Hollard had a strip of creosote brush ripped up and planted to the "wonder grass." The site was sloping, rocky, hot, dry, and devoid of all cover except for the brush. In a year's time it looked like a wheat field. Near Apache, in the southeast corner of Cochise County, Lehmann lovegrass has been holding down some abandoned dry farm land for the past several years. These are just a few samples. Similar results have been obtained on other ranches and highway rights-of-way.

Under what conditions will the planting of Leh-

mann lovegrass pay off. It does well practically anywhere that grass is sparse or non-existent and where the terrain is such that seeding equipment can be used. There are millions of acres where there is very little grass and where the only perennial vegetation is creosote bush, mesquite, black brush, burro brush, and the like. There are also many thousands of acres which once supported good stands of grama, but which, for one reason or another, now have little. While reseeding of grama on the plains of eastern New Mexico and Colorado is physically possible and economically feasible, the undertaking in southern Arizona is very hazardous. Lehmann lovegrass seems to be the answer on the semi-desert browse areas and on the denuded grasslands. How much country such as that just described is there in the upper half or two-thirds of such valleys as the San Simon, the San Pedro and the Santa Cruz, and in the Sulphur Springs Valley? What rancher having such lands wouldn't welcome more grass? Take, for example, the stretch of country (I don't know to whom it belongs) north and east of Douglas on either side of U. S. Highway 80. For several miles out of Douglas on the way to Silver Creek, Lehmann lovegrass has been planted in the highway right-of-way. It's there to see, and it looks good. Outside the right-of-way, while there may be an occasional patch of tobosa grass, mesquite or creosote bush are the principal plants, with bare ground intervening. If this bare ground were in lovegrass, the carrying capacity would be increased several hundred percent.

Everyone recognizes the importance of having a well balanced range; that is, one which isn't all browse or all grass, but one which has both browse and grass. While opinions may vary, few will argue that two-thirds grass and one-third browse isn't just about ideal. Throw in some spring annuals like filaree, and it's hard to beat. Of course, not all brush is forage—creosote isn't. But who's going to kick about the grass part of it if he doesn't have it now but could get it? Another important consideration is that browse alone doesn't, as a rule, hold soil erosion in check. Grass does the trick.

Now, while this lovegrass is a tough customer and can take some hard knocks from the weather and from grazing, too, on occasion, it's just like any other living plant. It can't be kicked around. Reliable information on its proper degree of use is lacking, but it's probable that no more than 40 percent of its annual growth should be grazed off. In other words, while it's undoubtedly a wonder grass, it isn't supernatural!

To get best results in planting, ground preparation, such as ripping or discing, is necessary. A shallow, firm seed bed is desirable. Seed can then be broadcast or drilled in. Best results are had with a seed drill followed by firming the ground with a cultipacker. Very good stands have been obtained, however, by simply ripping the ground, broadcasting the seed, and then forgetting all about it.

Where the average annual rainfall is 12 inches or better, solid seeding is feasible; and even where the rainfall is less, solid seeding can be done in flood plains. In case rainfall is below 12 inches and the planting is to be on other than flood plains, it is best to plant in furrows on the contour. Furrow spacing can be anywhere from 10 feet to 50 feet, depending on soil texture and steepness of slope. If, later on, it should prove to be that there is enough moisture between the furrows to accommodate more grass, the matter will be taken care of by natural reseeding from the furrow plantings. Where the problem involves "slick," bare ground, the process can be speeded up by breaking out new furrows between the old ones.

In some places, rabbits can really make a new small planting look sick, so the surest way of getting around them is to plant enough acreage at one time so that the rabbits and even grasshoppers can have some and still leave enough to grow beyond the seedling stage and survive.

Cost of planting depends on what equipment you have or can get, on the accessibility of the area to be planted, on the kind of soil, the amount of brush and a few other factors. Under average conditions, however, it shouldn't cost more than $1.50 per acre for contour seeding, and $3.00 for solid seeding. The cost may prohibit solid seeding except in the very best sites. No claims with respect to carrying capacity are being made, because it must be appreciated that Lehmann lovegrass is new in this country. On poor sites the figure will certainly be less than for good sites. In alluvial bottoms subject to natural flooding, it would not be surprising if 20 acres supported a cow yearlong.

Unfortunately, there are bottlenecks right now which are impeding a greatly expanded rate of planting. The first one is scarcity of seed. Plantings to date have been with seed raised in Soil Conservation Service nurseries. Owing to the war, commercial seed houses and farmers have not gone in for raising this relatively untried plant for seed. Seed production is not difficult, however.

(*Continued on page* 249)

Female buffalo grass plant, showing clusters of seed burs about three inches above ground surface.

Outlook Improves for Buffalo Grass

By JAMES E. SMITH, JR.

Thanks to Gordon L. Powers of the Soil Conservation Service nursery at Woodward, Okla., who has devised a method whereby each pound of buffalo grass burs can be made to yield about 8 times as many seedlings as it formerly could, high prices for buffalo grass seed need no longer stand in the way of more widespread use of this excellent grass.

Buffalo grass is one of the most important native grasses used in soil and moisture conservation work throughout the Great Plains from central Texas to North Dakota. But seed of buffalo grass is hard to harvest and expensive to buy, and field stands from moderate rates of seeding have been uncertain in the past.

Until about 1940, it is doubtful that more than 5,000 pounds of buffalo grass seed had been collected altogether. Since that date, many methods of collection have been employed by the Soil Conservation Service and a small number of private individuals with such increasing success that an estimated 100,000 pounds of clean buffalo grass burs were obtained in the fall and winter of 1943-44. Even so, seed prices ranging from $1 to $2.25 a pound still delay planting of many areas needing buffalo grass for erosion control.

As commonly handled and marketed, buffalo grass "seed" consists of a small, hard, nearly-waterproof bur, which may contain from 1 to 3 or 4 good seeds.

The 40-year-old Powers set out to find a way to get more seedlings from each pound of burs. He came up with an idea so simple that at first I hesitated to let him try it, with seed so badly needed in revegetation work. "Run the burs through a hammermill," he suggested, "and clean up the material in an ordinary fanning mill."

Finally I okayed a trial of Powers' idea, and reluctantly turned over to him a small quantity

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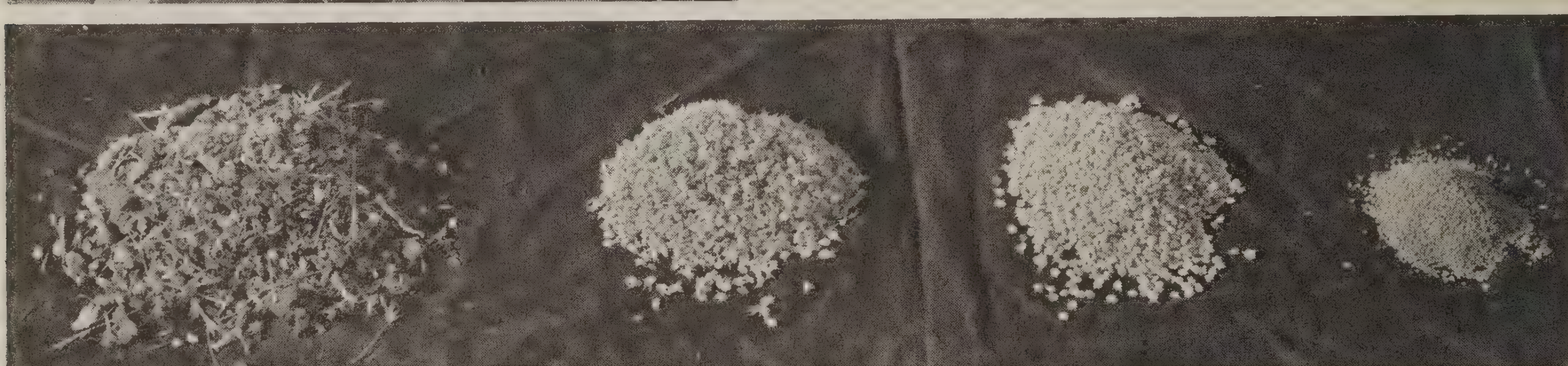
EDITOR'S NOTE.—The author is manager, Soil Conservation Service nursery, Woodward, Okla.

Gordon L. Powers at the hammermill used to remove awns from seed burs, and to produce pure, hulled buffalo grass seed from ordinary burs. The chamber at the lower part of the mill was designed by Powers to render mill operation practically dustless.



Buffalo grass seed. Left to right: combine-harvested seed material, clean burs as usually marketed, burs processed in hammermill to remove awns, pure seed obtained by breaking up burs in hammermill.

of buffalo grass burs collected for distribution to landowners establishing conservation practices in cooperation with Texas and Oklahoma soil conservation districts. Powers' idea worked like a charm, and the seed wasn't wasted.

We found that approximately 5 pounds of clean burs would yield 1 pound of clean, hulled seed. Untreated burs will germinate about 8 to 15 percent in 14 days, the period of time after planting during which most of the effective seedling emergence occurs, and will produce about 4,000 to 7,500 sprouts a pound. Hulled buffalo grass seed will germinate 70 to 75 percent in 8 to 12 days, and will produce around 240,000 sprouts a pound. These figures mean that a planting of 5 pounds of untreated burs an acre will result in 2 seedlings on 3 square feet, while one pound of hulled buffalo grass seed an acre will give 5 to 6 seedlings on each square foot of land.

Stated another way, these figures mean that to reach a planting rate of about 5 seedlings a square foot, which is considered ample for buffalo grass, a farmer or rancher can sow the hulled seed from 5 pounds of burs, instead of 40 to 50 pounds of burs. With seed at $1 a pound, the saving would be $35 to $45 an acre, although it's doubtful if anyone would spend that much to establish an acre of buffalo grass. With Powers' process buffalo grass can be seeded cheaply enough to make its use widespread.

The cost of hulling and cleaning buffalo grass seed, according to Powers' work, has averaged about 10 cents for each pound of clean seed. The hammermill used by Powers seems to be especially well suited for the work, but it is believed that

James E. Smith, Jr., nursery manager, weighs in a sack of newly harvested, freshly cleaned buffalo grass burs.

other makes and types can be used just as satisfactorily if proper screen sizes are available and careful speed adjustments are made. It is essential to break down the burs completely in order to free the individual seeds, but without damaging the seeds themselves.

A word of caution should be added regarding the use of hulled buffalo grass seed. Rates of planting such seed seldom will exceed one-half pound an acre, and ordinary seeding equipment such as grain drills cannot be adjusted for such a low poundage. Also, hulled buffalo grass seed cannot be mixed with chaffy blue grama, sideoat grama, or other similar seed material without danger of having buffalo seed sift to the bottom of the hopper and be planted first. Sorghum or corn chops can be graded to size and mixed with the hulled buffalo grass seed for planting in a regular drill.

To meet the need for special equipment to sow these small seed at very low rates, the nursery at Woodward has developed a drill hopper which will accurately plant not only hulled buffalo grass seed, but also other small-seeded grasses such as weeping lovegrass, sand lovegrass, and panic grass.

With these two developments the problem of revegetating Great Plains land for erosion control is a long way toward solution.

ARIZONA'S WONDER GRASS

(*Continued from page* 246)

On good irrigated farm land, yields of from 200 to 400 pounds of seed to the acre can be expected. Seed can be harvested and cleaned readily with a small combine. If a combine is not available the crop can be cut with a binder and laid in windrows, left for a few hours and then picked up carefully with forks and thrown into a tarp-lined truck and hauled to a stationary thresher. When one considers that there are 7 million seeds to the pound it readily can be seen that a small irrigated acreage devoted to seed production would result in a tremendously greater amount of range land being planted. Because of the smallness of the seed and its high viability, it only takes about 1 pound to plant an acre of range land.

One rancher in southwestern New Mexico, who believes the grass has great possibilities, has several acres of it under irrigation. He intends to raise seed and plant it on his range land. When planted for seed production on irrigated land, the grass can be drilled in rows and cultivated, or sown broadcast. As Lehmann lovegrass is a warm-weather grower, spring and summer are the best times for planting. Seed-increase plots should be established on clean land, free of Bermuda and Johnson grasses. Although considerably more production can be obtained from irrigated seed-increase plantings, good seed crops have been produced from range planting and are often worth harvesting.

No one should get the idea that Lehmann lovegrass will transform the desert. In the triangle cornered roughly by Kingman, Yuma and Ajo, there is a lot of country and scenery and not much else. Even here, though, it wouldn't be surprising if the "wonder grass" should do well on flood plains.

BENNETT HONORED IN COSTA RICA

From Costa Rica comes the report of a conference held recently at the School of Agriculture of the University of Costa Rica in honor of Dr. H. H. Bennett, chief of the Soil Conservation Service. Distinguished guests included the cultural relations officer; H. Gordon Minnegerode, the second secretary in charge of the economic section; Dr. Theodore J. Grant, director of the rubber experiment station at Turrialba; and Grover C. Kincaid of the food production division of the Institute of Inter-American Affairs. The conference was organized by Sr. Luis Arturo Fernandez, who was awarded a grant by the Department of Agriculture to study soil conservation methods in the United States. In addition to the aforementioned members of United States government agencies, the conference was also attended by the dean of the School of Agriculture, Ing. Fabio Baudrit, and the members of the first class to finish a course in soil conservation under the tutelage of Sr. Fernandez.

Sr. Fernandez and Dean Baudrit made addresses in which they emphasized the importance of soil conservation to Costa Rica, and expressed their appreciation to the United States government and to Dr. Bennett for making it possible for the University of Costa Rica to establish a course in soil conservation at the School of Agriculture. The valedictory was delivered by one of the students, Sr. Jose A. Torres.

In the Catawba Soil Conservation District, S. C., during the month of March, farmers planted more than 500 pounds of bicolor lespedeza seed to establish wildlife borders on unproductive margins between crop fields and woodlands.

LUMBER INDUSTRY WELCOMES CONSERVATION FORESTRY FARMERS

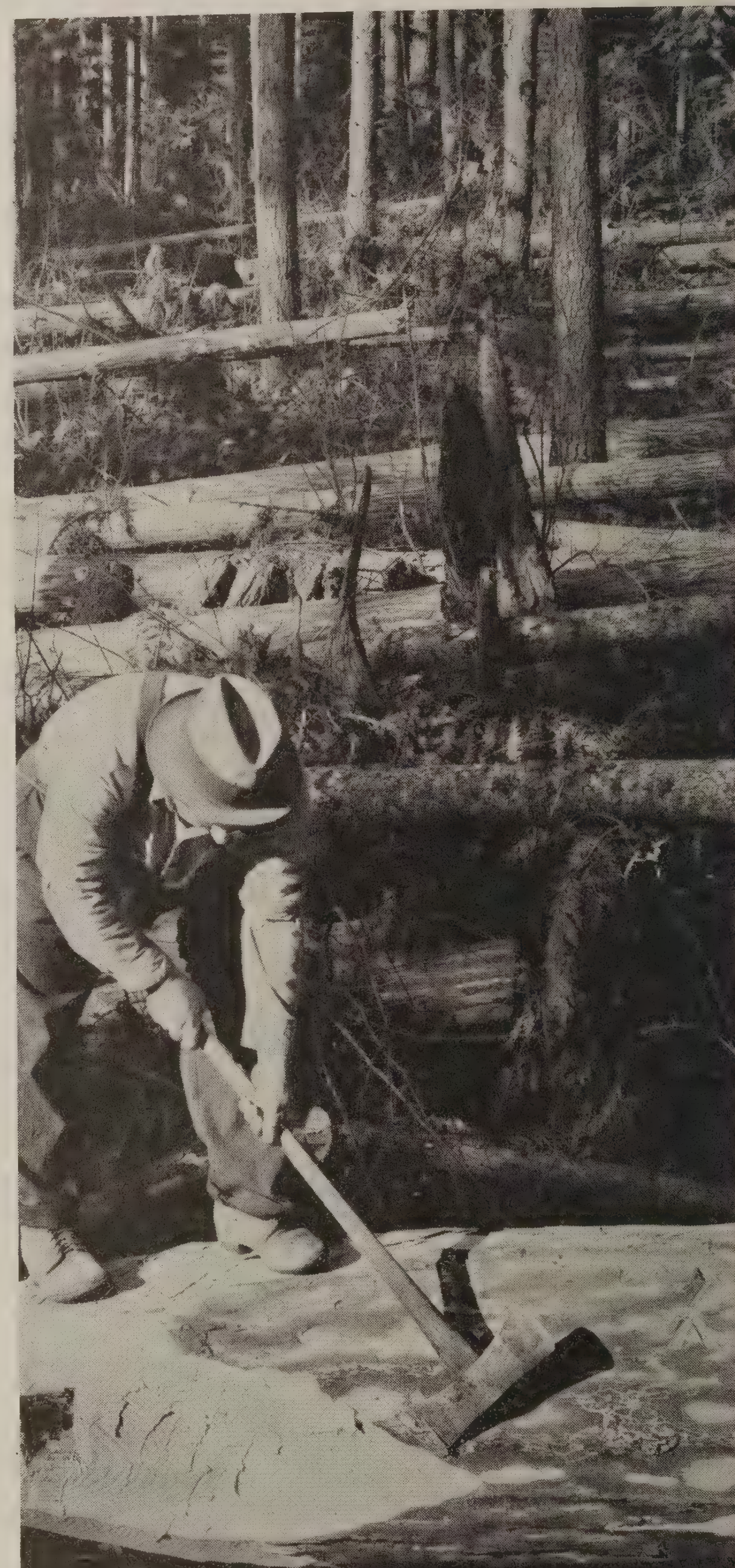
Col. W. B. Greeley, secretary-manager of West Coast Lumbermen's Association, presides at Snohomish farmers' tree farm dedication dinner. At his right is Charles L. Tebbe, assistant regional forester of the U. S. Forest Service, Portland; at his left, J. H. Christ, Pacific Coast regional conservator, Soil Conservation Service.

By ALBERT ARNST

Importance of conservation forestry on small farms now stands officially recognized by the practical-minded western lumber industry as 17 farmers in Washington's Snohomish Soil Conservation District display neatly framed American Tree Farms System certificates to prove it.

First farmers with small woodland holdings to be accepted into the industry's still new organization for promoting conservation forestry in general, all 17 are members of the Washington Forest Products Cooperative Association. (See *Soil Conservation* Dec. 1940, page 153.) The co-op was formed 5 years ago to enable its members to harvest their trees as a "crop" and to market their comparatively small individual amounts of timber products efficiently and profitably.

More than 9,000,000 acres already have been certified as American Tree Farms, on the West Coast and in the South. The welcoming of the Snohomish County farmers into the tree-farms ranks was hailed as a step of greatest significance, by farmers, foresters and industry leaders who took part in a big dedication dinner meeting sponsored by the Snohomish County Chamber of Commerce at Monroe. The farmers' certification was termed by Chief Forester E. H. McDaniels of the



Typical conservation forestry harvest cutting on a Snohomish Soil Conservation District-Washington Forest Products Cooperative Association farm.

coastal industry's Joint Committee on Forest Conservation as a "new landmark of industrial forestry."

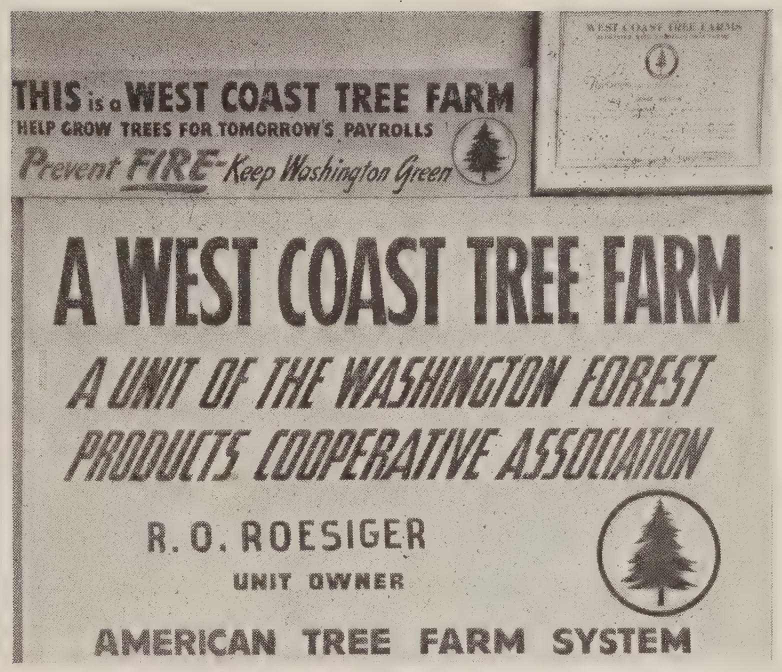
Colonel W. B. Greeley, secretary-manager of the

EDITOR'S NOTE.—The author is forestry specialist, Soil Conservation Service, Sedro-Woolley, Wash.

Getting out war-needed piling with a light tractor on James Eadon farm near Monroe, Wash. By handling his sales through the co-op, Eadon realized at least $1,000 additional.

West Coast Lumbermen's Association, put it this way:

"We are here tonight to welcome to this growing fraternity of tree farmers the real dirt farmers of Snohomish County. We, speaking of the industry, are ready to welcome *every* tree farmer, down even to one acre."



Tree farmer's identification: Top, right—framed certificate showing his forest lands have been designated as a West Coast Tree Farm. Top, left—property line sign to encourage fire prevention. Bottom—large signboard for posting property as tree farm.

And George L. Drake, logging company manager, of Shelton, and past president of the Western Forestry Conservation Association:

"Nowhere have I seen a more practical approach to farm forestry. What the companies want is a continuous forest crop. The industry knows that in the future it is going to be looking to individual farmers, because there always will be a substantial percentage of our timber products that come from private farm woods. We feel that the small owner can have a real part in the future of the industry; you small timber owners are tremendously important."

Pacific Coast Regional Conservator J. H. Christ, Portland, told the meeting:

"This meeting demonstrates a growing appreciation, or recognition, of the value of land. We are here talking over what we are going to do to see that our communities continue to thrive, that our lands are going to produce the best returns we can get from them, whether from timber or other crops. It is an inspiration to be here with these tree farmers, who are harvesting and marketing their timber 'crop' under sustained-yield methods. That way, they will continue to have timber to cut, and at the same time be keeping their land in its safest and actually most profitable use."

Assistant Regional Forester Charles L. Tebbe of the U. S. Forest Service, Portland, pointed out that a high percentage of the commercial timberland in western Washington and Oregon is in ownerships of from a few acres to fewer than

5,000 acres, with relatively few professional foresters to service them. He saw in the tree-farms movement the possibility that added facilities of private foresters may be brought into use.

Up until this certification, interest in the national tree-farms movement, which is a method of good forest management on private lands, had been confined largely to commercial forest farmers or large-scale owners and operators solely engaged in growing trees and harvesting lumber. Originators of the tree-farms idea in 1941 and sponsors of the American Tree Farms System in western Washington and Oregon are the West Coast Lumbermen's Association and the Pacific Northwest Loggers Association. Through their Joint Committee on Forest Conservation, these associations direct the certification program and pass upon applications in this vast Douglas fir region—which exceeds even the Southern pines area in potential growth rate.

Standards for tree-farms certification are high. The timber owner agrees to maintain his designated land for the production of forest crops, to provide reasonable protection from fire, insects, disease and damage from excessive grazing, to harvest the timber in a manner that will assure future crops, and to furnish information periodically on his progress, future plans and improvements in protection or cutting practices. These Snohomish County farmers also were able to qualify because of having the technical services of recognized foresters available through the soil conservation district.

Snohomish County Forestry Cooperative farmers already have been running their farm woodlands just that way. Good timber cropping is nothing new to this group of back-40 Paul Bunyans, who consider it simply good business. Their intensive management of farm woodlands began in an organized way in 1938, with the technical assistance of Soil Conservation Service foresters. Through the Service's demonstration program, they learned what could be done on lands unsuited for cropping or pasture or on lands dedicated to other kinds of forest production.

As a result of stimulated popular interest in tree farming as a permanent income source, 45 tree-minded farmers in 1940 organized the forestry Co-op, the first one west of the Mississippi River. Their objectives have been adhered to through almost 5 years of business operation. Their crop has been the junior forest of today—the stands of second-growth Douglas fir on hillsides, red alder in creek bottoms, cottonwoods along streambanks, western red cedar in shady dells, and cascara along fence rows.

The cooperative is made up of practical farmers—80 of them now. Business-wise and woods-canny, Manager Lester J. Sims of Sultan, a tree farmer himself, has found favorable markets, shopped for the best prices, supervised the woods operations and kept things moving in systematic fashion. Wartime, for example, has supplied ready markets, but it also has created problems of labor and other handicaps described by Co-op President M. C. James of Arlington, as the toughest since after the Civil War. Nevertheless, in 1944, the co-op send 35 thousand lineal feet of piling and 400,000 board feet of sawlogs to the war markets. The association has maintained a gross business of about $40,000 a year. Part of the members' dividends have been turned back and a 32-horsepower blade-equipped tractor and a portable "jammer" bought, with which forest roads are built and logs are dragged out of the woods and loaded. The equipment investment has been kept to a minimum, though, and the soundness of the co-op's financing is reflected in the fact that the members' assets in the organization far exceed its obligations. Best of all, a good job of forest conservation has been done.

Let the report of the inspecting forest engineer of the Joint Committee of Conservation attest to the kind of forestry practiced:

"The cuttings were inspected and they are the most intensive and best examples of forestry observed in the (Douglas fir) region. Stands are almost entirely second-growth. Windfalls, suppressed and defective trees and tops are worked up into fuel and similar products. High valued trees needed to fill an order are moved in accordance with the cutting plan. It resembles an improvement cutting, in that crowded trees are released and their growth accelerated. It is not necessarily a selection system. Where the stand and market indicate, clear cutting on small areas is practiced . . ."

The Snohomish Soil Conservation District develops conservation farm plans with co-op members, in which recommended land use is indicated, according to land use capabilities. These plans also have the forest areas typed out on aerial photos which offer a convenient reference source for woodland planning. General management assistance, including tree marking, is provided. Planting stock has been furnished some cooperators, and over-all educational assistance in farm forestry has been given. But sales negotiations between co-op members and buyers, marketing information and supervision of woods operations

are handled by the co-op itself, through Manager Sims.

James, president of the co-op since its organization and himself owner of 60 acres of fir and cedar, believes West Coast Tree Farms affiliation is an important step forward in farm forestry, because it publicly proclaims the importance of the small woodland in regional forest management plans.

"Working cooperatively and systematically, farmers constitute a well managed forest area of industrial significance," he said. "Our co-op membership alone includes about 10,000 acres of woodland, ranging in size from seven acres to 345 acres. You can readily see that if we do a good job of timber growing, our contribution to local wood using industries will be important."

"Though we haven't done anything very big, we have done something significant—proved that it is practicable and profitable to practice selective forest logging. About the biggest thing we've done is to make our members forest conscious."

The tree farmers receive signboards for posting their property as such, and smaller property lines signs requesting cooperation in fire protection to "Keep Washington Green." The certification also entitles the co-op to use the American Tree Farms symbol in its office and on its stationery.

Thus, a new rural pattern in farm forestry is being established, identifying to the general public those forest owners who are practicing conscious and permanent management in growing timber. Every West Coast Tree Farm sign that is placed crystallizes forest progress in the Pacific Northwest and heightens public appreciation of a basic resource.

West Coast Tree Farms officials plan to extend certification to other qualifying farmers in the Douglas fir region. James hopes to see every member of the Washington Forest Products Cooperative Association a Tree Farms member eventually.

The 17 co-op farmers so far certified as Tree Farms members are:

Mayo Ball and John Enselman, Arlington; Duncan Barr, Monroe; William Bayh, Granite Falls; Mrs. Susan Gatheres, Arlington; George Hjort, Arlington; President James; W. R. Millard, Granite Falls; Mrs. Quincy Mueller, Granite Falls; Luther Orr, Arlington; R. O. Roesiger, Snohomish; J. E. Saunier, Granite Falls; William H. Sheeler, Sultan; Manager Sims; Secretary John Spada, Snohomish; Jasper Storm, Sultan; S. A. Sweene, Woodinville; and John Westin, Arlington.

RAISING THE FERTILITY LEVEL

By B. H. HENDRICKSON

There is no doubt that our soil is basically responsible for the low crop yields and low farm incomes in the Southern Piedmont and the South in general. The causes are well known—too much row cropping, too active erosion, and serious depletion of farmlands that were not of the highly-productive type when first cleared, as compared with the better agricultural soils of the United States.

We have found it necessary to use commercial fertilizers in substantial amounts to supply plant food for crops. Usually, it is the money crops that receive the bulk of the fertilizer. We are prone to prepare our seedbeds with considerable care for the next crop to be grown, without giving much thought to raising the fertility level of the farm as a whole. But, as Benjamin Franklin wrote in "Poor Richard's Almanac," "A deposit of fertility in the soil bank is the safest, and pays the best."

Editor's Note.—The author is project supervisor, Southern Piedmont Conservation Experiment Station, Soil Conservation Service, Watkinsville, Ga.

We have the option of making our farms more fertile and more profitable, since most of our soils respond readily and profitably to good treatment and proper land use.

In practical farming, this means using all methods that will provide a good margin of profit and at the same time protect and improve the soil. These methods need to do more than just check erosion wastage, and depletion of soil organic matter. They must also maintain a supply of essential minerals in the soil, in order to "make a deposit of fertility in the soil bank." New conservation farming methods that accomplish these results are now coming into general use.

The rate of erosion wastage of farmland soils varies widely, depending principally on the degree and length of slope, and on the type of crop cover. By actual measurement, annual erosion losses even from the intervals between terraces on moderate to steep eroded slopes planted continuously to cotton amounts to 30 to 50 tons per acre per year. These tonnages happen to be the minimum and maximum freight car load capacities of our

railroads. We can hardly expect to maintain a productive agriculture if our cropland continues to suffer a freightcar load of soil loss per acre per year. But we now know how to reduce such tremendous soil losses.

Good cropland management for the Southeast should include terracing with meadow outlets where needed, and always feature crops and cultural methods that effectively check erosion. A recent trend is the more general use of close growing legume crops that provide nutritious forage for livestock, reduce soil losses, and leave residues on the land to increase the supply of soil organic matter. A better understanding of the mineral needs of crops makes it possible to produce products of higher food value, resulting in healthier livestock, and healthier people.

There are other worthwhile advantages in the use of conservation-type cropping methods. Increasing the soil organic matter supply makes the soil more retentive of rainfall and of plant food minerals which in turn tend to increase production and generally improve the quality of the crop. The soil has become a safer storehouse for soil moisture and plant nutrients, and improved efficiency in the use of fertilizers is possible.

When we check closely, as we should, the degree of fundamental soil improvement actually accomplished by treatments we notice that progress is likely to be slow even though crop yields increase sharply. For example, experiments have shown that additions of organic matter to the soil effected by close-growing legumes and their residues, or by leguminous green manures and composts, are to some extent used up by the row crops that follow in rotations. The more residue-producing, close-growing legumes such as annual lespedeza or other organic additions in the rotation and the less row-cropping, the larger will be the accumulation of the net organic matter in the soil, and the more substantial the increase of fertility in "the soil bank."

It is fortunate that conservation-type cropping methods are capable of improving the soil rapidly where improvement is most needed, as on eroded slopes planted to kudzu and sericea lespedeza. These crops are capable of establishing complete coverage on depleted eroded land, low in plant food, and of raising rapidly the organic matter content of the soil. On average land, this amounts to as much as 4 tons per acre per year. Ample fertilization to maintain heavy production is absolutely necessary and highly profitable. The way to make substantial progress in soil improvement is clear. It means better land use. For croplands, on most farms, it means confining row crops to far as practicable level or gently-sloping land, rotating them with crops like crotalaria and winter legumes to supply organic matter. Row crops should occur less often, and always in protective-type rotation with brass or legumes, on eroding slopes. The close-growing summer legumes fit into the rotation best, as they very effectively check erosion during the summer months when three-fourths of the annual soil loss occurs. Erosion is too active on most steep slopes to permit growing row crops without heavy soil loss.

In principle, then, adjusting cropping methods to cropland conditions in the Southeast appears to be largely a matter of increasing the proportion of land in close-growing summer legumes in the rotation as slopes become more steep and topsoil becomes thinner, fertilizing properly to aid in increasing fertility and keeping everlastingly at it, to hold the gains.

Conserving "a deposit of fertility in the soil bank" will be safest, and pay best, during the years to come. To accomplish this will take time as abrupt changes are impractical, on the average farm. Nor can we afford to do the reverse, and allow erosion and depletion to continue at a rapid pace, and further damage our soil resources.

The job calls for intelligent planning to provide gradual adjustment of farm lay-outs of field, pasture and woodland for crop production and livestock. The aim is to maintain and improve farm income and at the same time assure progress towards a sustaining soil.

MEET JIM SKINNER OF MICHIGAN

(*Continued from page* 239)

operating farmers at $199,076.57 about $1,000 per farm. The values range from 10 cents a tree for 631,130 trees planted, to $3 an acre for 3,412 acres of contouring, to $10 an acre for 426 acres terraced and 3,570 acres seeded to grass, to $80 an acre for 206 acres of muck developed for cropland.

Jim Skinner's message to farmers in soil conservation districts all over the country is: "The future of the agriculture of America is in your hands. Don't neglect it."

Walter W. John

Lord Northbourne writes: "Good cultivation is always beautiful, but most of us have a taste for wildness as well. It is pleasant that the best cultivation of all should be that which is not without its touch of wildness."

A NEW COVER CROP FOR VINEYARDS

By HOMER E. STENNETT

There are probably few places in our country where soil erosion is a greater problem than in the vineyards of the New York Finger Lakes region. The cause is easily explained. The controls are often more difficult. Most of the land near the lakes occurs on long, steep slopes. Erosion is further increased by the clean cultivation considered necessary during spring and early summer.

The life of a vineyard is long, as long as 100 years or more on good sites, so that few new vineyards need be planted to maintain present acreage. Most of the vineyards were planted without regard to contour and much of the original organic matter has been lost.

The first vineyard known in the Finger Lakes region was planted in 1830 by the Reverend William Bostwick in Hammondsport, N. Y., at the head of Lake Keuka. This venture proved successful and soon other vineyards were being planted. Only table grapes were grown at first and these were limited by the slow transportation facilities then available to take the perishable fruit to market.

It was soon learned that the grapes grown in this region were particularly high in sugar content and equal in quality to the wine grapes of France. This, of course, is still a subject for mild debate between American and French producers. Nevertheless, a wine industry developed which solved the transportation problem and proved a great impetus to the planting of vineyards in New York State. Vines more hardy than the first imported varieties presently were developed by crossing with the American fox grape.

Grape production proved highly profitable, and vineyards were planted more and more extensively. The fairly well-drained soils near the lakes were ideal for this form of husbandry. There, the long slopes with a large volume of water at the base causes excellent air drainage, which lengthens the growing season. The air movement also facilitates rapid drying of dew and rain from the leaves, and thus helps to give comparative freedom from disease.

It has long been recognized that a winter cover crop is needed which will take over after cultivation ceases in summer. Many of the conventional cover crops have been tried, but with dubious success. Vineyardists in general have rejected them all for one reason or another, although domestic rye grass has been used successfully in some instances.

There is one plant, however, a common weed, which shows considerable promise of being just what is needed. Chickweed (*Stellaria media*), is gaining favor among many vineyardists after years of ignoring or fighting it.

Frequent observations of this plant as a cover crop, over the last two years, have brought to light many of its characteristics. All the chickweed observed was from natural seedings. Its growth is spotty, due possibly to frequent plowing which turns seed under too deeply. Sometimes large sections of a vineyard will be deeply carpeted while other sections nearby are bare.

Chickweed is a winter annual which produces seed continuously from about October 1 until the end of its life cycle. Ripened or partially ripened seeds can be found on the plant during that whole period. At the time of the first cultivation in the spring a large amount of seed will have been produced. This seed is long lived and may be in the ground for years before germinating. Although the seed is produced abundantly, it is difficult to harvest because it is very small and grows close to the ground. This close-growing habit also prevents the spread of the seed.

Good soil favors chickweed, but it will grow, albeit less luxuriantly, on poor soil, especially if encouraged by an application of manure. Single plants growing alone have been observed which closely cover a space of ground one foot across.

After cultivation ends about the middle of July the chickweed begins to grow. By late September the ground is covered with a blanket of green. This cover remains green all winter. Soil with a cover of chickweed is mellow and easily plowed, in contrast to bare soil. This is the characteristic most often commented on by farmers.

This plant has much the same growing habit as Korean lespedeza, although it is hardier. Possibly here is another weed which eventually may be admitted to the ever-growing family of plants useful to man.

Editor's Note.—The author is assistant state conservationist, Soil Conservation Service, Watkins Glen, N. Y.

Have you seen the new 500-page, illustrated War Department Education Manual EM 800, "What is Farming?" Several chapters were by SCS members, W. R. Van Dersal and E. H. Graham.

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Federal-State Cooperative Snow Surveys and Irrigation Water Forecasts for Colorado River Drainage Basin, February 1, 1945. Division of Irrigation, Soil Conservation Service, Berkeley, California, with the cooperation of the Colorado Agricultural Experiment Station. February, 1945.

Federal-State Cooperative Snow Surveys and Irrigation Water Forecasts for Colorado River Drainage Basin, March 1, 1945. Division of Irrigation, Soil Conservation Service, Berkeley, California, with the cooperation of the Colorado Agricultural Experiment Station. March, 1945.

Federal-State Cooperative Snow Surveys and Irrigation Water Forecasts for Missouri and Arkansas Drainage Basins, February 1, 1945. Division of Irrigation, Soil Conservation Service, Berkeley, California, with the cooperation of the Colorado Agricultural Experiment Station. February, 1945.

Federal-State Cooperative Snow Surveys and Irrigation Water Forecasts for Missouri and Arkansas Drainage Basins, March 1, 1945. Division of Irrigation, Soil Conservation Service, Berkeley, California, with the cooperation of the Colorado Agricultural Experiment Station. March, 1945.

Federal-State Cooperative Snow Surveys and Irrigation Water Forecasts for Oregon, March 1, 1945. Division of Irrigation, Soil Conservation Service, Berkeley, California, with the cooperation of the Oregon Agricultural Experiment Station. March, 1945.

Federal-State Cooperative Snow Surveys and Irrigation Water Forecasts for Rio Grande Drainage Basin, February 1, 1945. Division of Irrigation, Soil Conservation Service, Berkeley, California, with the cooperation of the Colorado Agricultural Experiment Station. February, 1945.

Federal-State Cooperative Snow Surveys and Irrigation Water Forecasts for Rio Grande Drainage Basin, March 1, 1945. Division of Irrigation, Soil Conservation Service, Berkeley, California, with the cooperation of the Colorado Agricultural Experiment Station, March, 1945.

New Concepts in Farm Forestry. Soil Conservation Service. Reprinted from THE JOURNAL OF FORESTRY, Volume 42, Number 10. October, 1944. mm.

Problem Situations in Contour Plowing. Regional Office, Soil Conservation Service, Lincoln, Nebraska. March, 1945. Processed.

OFFICE OF INFORMATION U. S. DEPARTMENT OF AGRICULTURE

Agricultural Statistics, 1944. Yearbook Statistical Committee, U. S. Department of Agriculture.

Chemical Impregnation of Trees and Poles for Wood Preservation. Circular No. 717. Bureau of Entomology and Plant Quarantine, Agricultural Research Administration. December, 1944. 10¢. [1]

The Farm Real Estate Situation, 1943-44. Circular No. 721. Bureau of Agricultural Economics. January, 1945. 10¢. [1]

Five Dollars an Acre—To Help You Increase Flaxseed Production and Help Win the War. AIS-12. Agricultural Adjustment Agency, War Food Administration. March, 1945.

Growth Studies on Guayule (Parthenium argentatum). Technical Bulletin No. 885. Bureau of Plant Industry, Soils, and Agricultural Engineering, Agricultural Research Administration. February, 1945.

Planning the Farm for Profit and Stability. Farmers' Bulletin No. 1965. Bureau of Agricultural Economics. February, 1945. 10¢. [1]

Quality Characteristics of Wheat Varieties Grown in the Western United States. Technical Bulletin No. 887. Bureau of Plant Industry, Soils, and Agricultural Engineering, Agricultural Research Administration. March, 1945. 10¢. [1]

Wartime Changes in the Financial Structure of Agriculture. Miscellaneous Publication No. 558. Bureau of Agricultural Economics. February, 1945. 10¢. [1]

Yields of Barley Varieties in the United States and Canada, 1937-41. Technical Bulletin No. 881. Bureau of Plant Industry, Soils, and Agricultural Engineering, Agricultural Research Administration. December, 1944. 15¢. [1]

STATE BULLETINS

Agricultural Research Serves Farmers, Ranchers and Industry. Fifty-Fifth and Fifty-Sixth Annual Reports, 1942-1943. Agricultural Experiment Station, Texas A. & M. College Station, Texas, December, 1944.

Bimonthly Bulletin. Vol. XXX, No. 232. Agricultural Experiment Station, Wooster, Ohio. January-February, 1945.

Do I Want to Farm? A Guide for Service Men, Industrial Workers and Others Considering Farming as a Vocation. Bulletin No. 267. Extention Service, Michigan State College, East Lansing, Mich. February, 1945.

Effect of Land Use and Season on Runoff and Soil Loss. Bulletin No. 347. Agricultural Experiment Station, University of North Carolina, Raleigh, North Carolina, with the cooperation of the Soil Conservation Service, U. S. Department of Agriculture. December, 1944.

Farm Science Looks Ahead. Bulletin No. 317. Agricultural Experiment Station, Morgantown, West Virginia. December, 1944.

Fertilizer Recommendations for 1945. Bulletin No. 159. (Revised). Departments of Soil Science and Horticulture. Michigan State College, East Lansing, Mich. February, 1945.

Fifty-Fourth Annual Report for the Fiscal Year Ended June 30, 1944. Bulletin No. 455. Agricultural Experiment Station, Pullman, Washington. December, 1944.

Georgia Can Increase Peanut Production by 50 Per Cent Without an Increase in Acreage. Press Bulletin No. 543. Georgia Experiment Station, Experiment, Georgia. March, 1945.

Grain Sorghums Under Irrigation in the Wichita Valley. Progress Report No. 936. Texas Agricultural Experiment Station, A. & M. College of Texas, College Station, Texas. March, 1945.

[1] From Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.

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SOIL CONSERVATION

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VOL. X—No. 12 JUNE · 1945

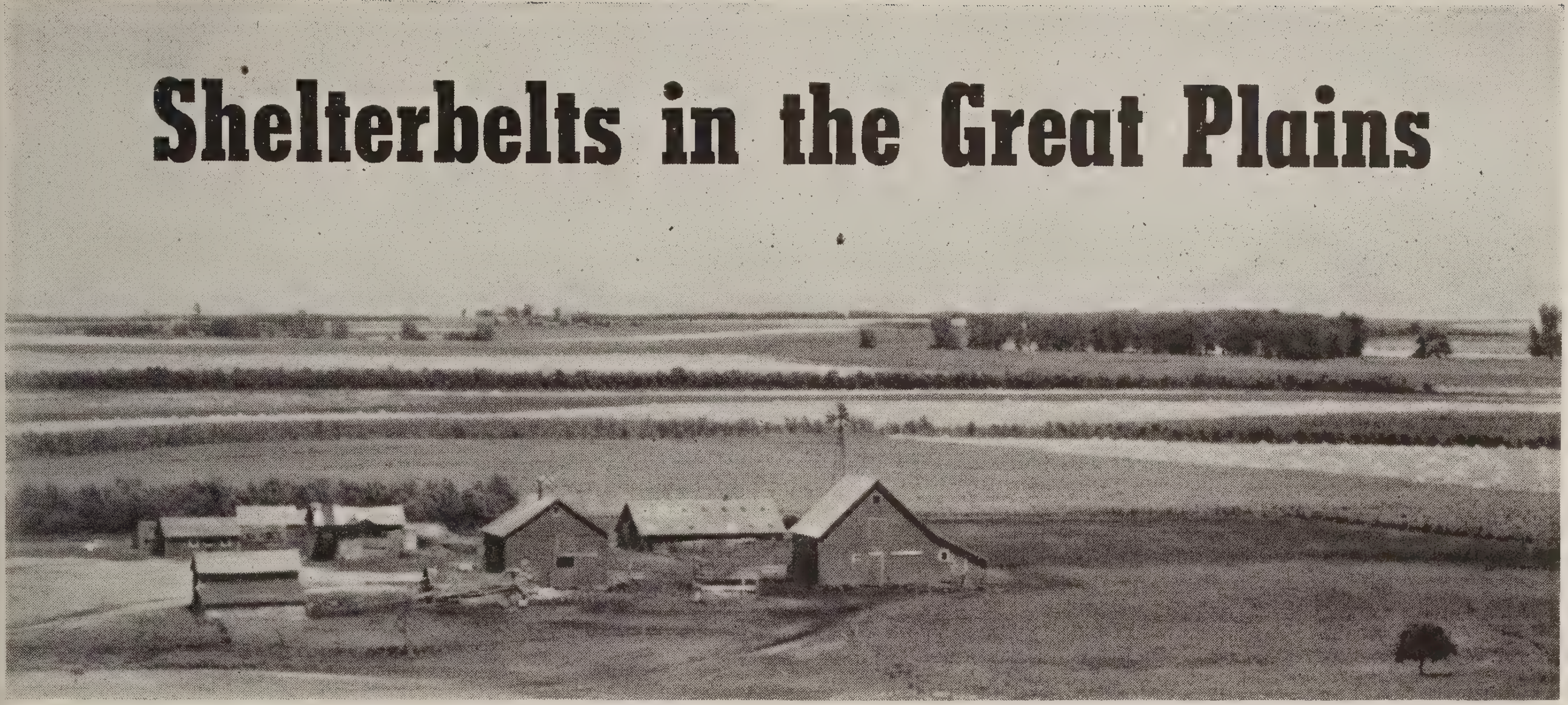
WELLINGTON BRINK EDITOR

CONTENTS

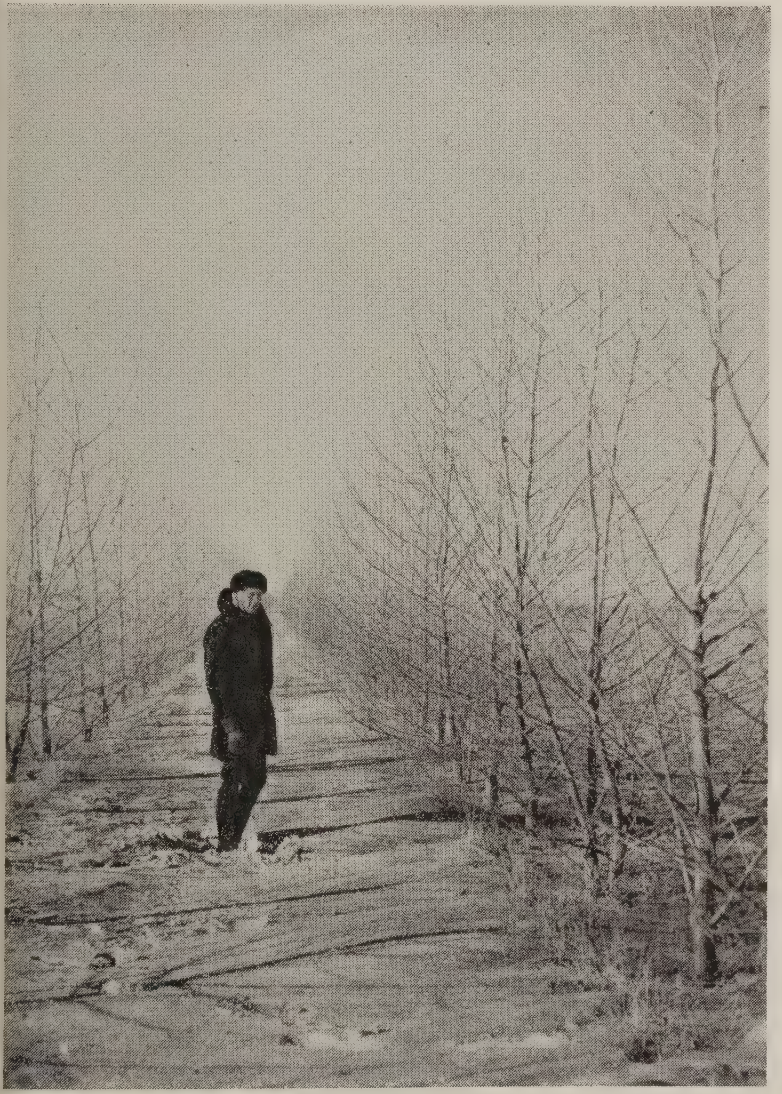
Front Cover: Betty Mueller with an armful of oats, on the John Mueller farm near Winona, Minn., July 1944. The grain is grown there in contour strips, of course. Photographer: W. H. Lathrop.

SOIL CONSERVATION *is issued monthly by* SOIL CONSERVATION SERVICE of the United States Department of Agriculture, Washington, D. C. The matter contained herein is published by direction of the Secretary of Agriculture as administrative information required for proper transaction of the public business, with the approval of the Director of the Budget. SOIL CONSERVATION seeks to supply to workers of the Department of Agriculture engaged in soil conservation activities, information of special help to them in the performance of their duties. Copies may be obtained from the Superintendent of Documents, Government Printing Office, Washington 25, D. C., 10 cents a copy, or by subscription at the rate of $1.00 per year, domestic; $1.50 per year, foreign. Postage stamps, will not be accepted in payment.

Shelterbelts in the Great Plains



Shelterbelts clear to the skyline. An area south of Mitchel, S. D.



Part of a 30-acre planting in the Park River area, N. D. Even in 1939 when this picture was made windbreaks and farmstead planting had vastly increased the value of the land.

By JOHN W. KELLER

In the Great Plains prolonged droughts and strong winds have intermittently harassed the rural population and made agriculture insecure. These hazards can not be eliminated entirely and any factors that aim to ameliorate them and temper their devastating effects are readily grasped by farmers and ranchers.

The planting of trees long has been recognized as a practical means of checking the effects of strong winds and the many harmful results to agriculture that accompany them. The purpose of belts of trees in the Great Plains is to deflect and slow up winds near the ground. Where this can be accomplished, it will temper the hot, dry winds of summer and the cold winds of winter, check the devastating dust storms which carry away the top soil, prevent excessive evaporation, and retain soil moisture for the production of agricultural crops.

Shelterbelts are now one of many conservation practices useful in the program of soil conservation districts, particularly in the Great Plains region.

History

Tree planting to conserve moisture for crops has been successful in Europe and, coming closer to home, in Canada as well.

Editor's Note.—The author is assistant chief, Forestry Division, Soil Conservation Service, Washington, D. C.

In Eastern Russia shelterbelts have been planted in the steppes from the Black Sea to North of the Caspian on land that in many respects bears close resemblance to our own prairie region. The results of established shelterbelts in Russia were so favorable that the planting of over 800,000 acres of shelterbelts was included in the Soviet second 5-year plan, of which we heard so much before World War II.

In Hungary the climate, soils and precipitation southeast of Budapest are quite similar to our prairie region. Here the planting of shelterbelts for the protection of orchards, vineyards and cultivated fields has been common for many years. Legislation in Hungary in 1923 provided for a definite system of shelterbelts which were to be planted by the farmer who in return would receive planting stock at nominal prices and a reduction of taxation. These shelterbelts are reported to reduce evaporation of soil moisture, promote the formation of dew, retain litter and snow, stabilize sandy soils, protect flowering, hasten the ripening of fruit, decrease breakage of fruit trees, decrease premature fruit dropping and reduce the dust. These beneficial effects are attributed largely to a reduction of wind velocity.

In Denmark shelterbelts and hedges of trees and shrubs have proved to be the most satisfactory means of reducing high wind velocity and attendant damage. Strong winds from the North Sea in Jutland gradually buried under drifting sand a large area of once fertile agricultural soil. It is claimed that these strong winds destroy gardens, damage plants and buildings, dry out sod and whip the grain in the fields if unprotected by shelterbelts. The Danes attribute to shelterbelts favorable local effects upon air and soil temperatures, wind velocity, evaporation, relative humidity of air in local areas, and increase yields up to 30 percent for some crops.

In the prairie region in Southwestern Manitoba and portions of Saskatchewan and Alberta the soil topography and climate are quite similar to those in our Great Plains. Governmental aid and encouragement to shelterbelt plantings have assisted the development of planting methods and the testing of tree species. Early settlers in Canada planted thousands of trees about their homesteads but failures were general because of unsuitable species and lack of experience in tree culture under those rigorous conditions. In 1901 the Dominion government established experiment stations and a system of cooperative planting was begun whereby farmers were supplied with planting stock free of charge if they would carefully follow instructions in planting, cultivating and caring for the trees. Under this system the plantings are reported to be generally successful.

The beneficial effect of trees was recognized in the United States at an early date and legislation has been enacted through the years in an attempt to compensate for land misuse. In the United States the Great Plains comprise about 30 percent of the continental United States. As civilization traveled westward and increasingly large areas of sod were broken, frequent droughts and dust storms resulted in increasing economic loss and human discomfort and suffering. Tree planting was one of the first measures to relieve this distress. The Timber Culture Act of 1873, the Kincaid distribution in the agricultural appropriation act of 1911, the establishment of experiment stations in 1913, the Clarke-McNary Act of 1924 and numerous State laws encouraged tree planting. Unfortunately many of the early plantings not only received little or no care, but they were severely handicapped by heavy grazing. However, a few of them stand today as monuments to the foresight and painstaking care of the early settlers.

The planting of shelterbelts in the Great Plains is advisable wherever soil, precipitation and other climatic conditions do not forbid tree growth and where agriculture is sufficiently developed to need the protective influence of trees. All of the evidence available from studies that have been made and from the experiences of farmers and ranchers who have shelterbelts indicate that the plan for shelterbelts in the Great Plains is sound.

Specifications

Foresters think that trees should be planted close together so that the branches will grow together quickly and eliminate the necessity of cultivation. Foresters also claim that close planting with closed borders and complete protection from fire and grazing will develop a "forest" soil. Such a soil with its litter cover and permeable physical structure will conserve and store moisture to be used for the growth of the trees.

The spacing of early plantings included a variety of widths between rows, of spacing within rows, and of number of rows. Shelterbelts contained from 1 to 20 rows and these rows were from 8 to 12 feet apart with 10-foot isolation strips on each side. The distances apart in the rows of 2 to 8 feet were varied with the species. One, two and three row belts have been success-

fully planted and maintained and have been effective in Oklahoma and Texas. Further north where snows are frequent, wider belts tend to collect the snow in drifts thus materially increasing the moisture for tree growth. The loss of a few trees in a narrow belt, which permits the wind to sweep through the openings, may destroy

Shelterbelts such as this help to harness the wild winds that come roaring across the plains. They protect land, wildlife and man, and at the same time add a touch of beauty.

A barrier against the fiercest wind, as reared in Burt County, Neb. The trees form a triangle-shaped shelter, with the slower-growing species at the left and the more rapidly-growing species at the right.

the effectiveness of the entire shelterbelt. The additional land and expense required to plant a few extra rows is the cost of insurance against possible complete or partial failure. Five to ten rows varying in height from shrubs to tall trees are now favored over the wider belts that were established a few years ago. The graduation in height from low shrubs on the outside of the belt to high trees in the center imparts an upward sweep in the air currents. The effect is felt to some extent at distances to leeward as much as 50 times the height of the trees. Twenty times, however, is usually considered to be the practical limit of effect.

We know now that zones or solid belts of trees from the North to the South as originally contemplated would have been a mistake, and in fact such planting never was attempted. The direction of the belts is carefully selected in relation to the prevailing winds. Sometimes they run North and South, sometimes East and West, and at many locations they are established in both directions to control winds during different periods of the year. The important problem is to locate the trees so that most of the air currents are dispersed before they get strong enough to damage agricultural crops. East-West belts frequently give this protection against summer winds but will not provide protection against the quartering winds of winter. It is because of the variableness of wind direction that belts in both directions are necessary. The frequency of belts depends upon the local conditions and the degree of protection necessary. Usually the intervals do not exceed 1/4 mile and under some conditions it may be advisable to have them as close together as 1/16 of a mile.

Species and Arrangement

In planning a shelterbelt, certain kinds of trees and shrubs are better than others. A great number of shrubs and evergreen and broadleaf trees have been planted during the past 50 years with varying degrees of success. The choice of species depends upon their adaptability to climate and soil, their susceptibility to insect and fungus damage, their economic and aesthetic values, and the degree of protection required. The hardwood trees found to be most useful in the Plains are cottonwood, green ash, American and Chinese elm and honey locust. Evergreens that have thrived best are eastern red cedar, Rocky Mountain red cedar, Austrian and ponderosa pine. Shrubs best adapted are Russian olive, Siberian pea, wild plum, lilac and choke cherry. The arrangement of rows usually provide shrubs on the outside, evergreens next, tallest broadleaf trees in the center.

Protection and Care

Shelterbelts must be protected and, until well established, they should be cultivated. Trees will not live or a shelterbelt be effective if browsed and trampled by livestock. In early stages the trees are easily killed by competition of grass and weeds. Three to 5 careful cultivations annually are needed during the first 5 to 6 years after planting. This removes weed competition, aerates the soil, and puts it in better condition for holding moisture. Dead and diseased trees should be removed. The trees in the interior rows may be pruned, but no pruning should be done on the outside trees nor on any of the evergreens or shrubs. Trees that die during the early part of the life of the shelterbelt should be replaced the following planting season. When planted close together the trees crowd each other and suppressed trees will eventually die. Suppressed trees may be removed while the wood is still sound.

Influences

The direct and indirect results from shelterbelts in the Great Plains have been studied by numerous federal and local agencies. Many of these surveys pointed to benefits that were so great that most of the results were never published. Long time records of the influence of shelterbelts on crop yields in the United States are not available. The experiments that have been carried out indicate that shelterbelts not only hold the soil in place and control wind erosion but, in addition, crop yields have been increased, livestock has required less winter feed, farm buildings have needed less fuel, and farm gardens have produced more abundantly. One careful survey conducted in South Dakota shows that farmers who have shelterbelts believe that trees add $1,000 to the value of each 160 acres.

Shelterbelts become a source of post and fuel material for the farmer after the belts have attained an age of 10 years and older. Desirable wildlife, game and insectivorous birds seek protection and propagate within the shelterbelts. This wildlife frequently is a source of food and recreation and the aesthetic value of the trees should not be discounted. In fact shelterbelts offer shade from the sun, shelter from the wind, improved appearance to the area, and increased value to the land. These factors add to the stability of farm life.

Agriculture in the Plains States without trees is hazardous. The best proof of the value of shelterbelts comes from the farmers who have them. These farmers even under war time restrictions and manpower shortage and without governmental aid except for free trees, are continuing to plant shelterbelt trees by the hundreds of thousands.

Disadvantages

Most of the disadvantages reported as a result of shelterbelts arise from badly selected locations. On any farm, trees in the wrong places are a handicap, not a help. It is true that shelterbelts break up large fields into tracts that are inconvenient and economically difficult to handle with heavy machinery. In some locations they may cause snow to collect in drifts on roads and about buildings, and may encourage late spring frost if they cut off air movements near the ground. However, the positive disadvantages of shelterbelts are so few and so trifling when compared with the benefits that only brief mention is necessary. In fact, the shelterbelts that have been established in the Great Plains stand as markers to the practical ideal of the pioneers who strove to bring forest benefits to a treeless region.

Future Plantings

Shelterbelts have been incorporated into the conservation program administered by soil conservation districts, with excellent results. The planting of shelterbelts as a separate project was discontinued in 1942. Since that time no special appropriations have been available but the work continues to go forward as a part of the farm conservation program that the Soil Conservation Service is carrying on by assisting soil conservation districts. Up to March 1, 1945, soil conservation districts have been organized over almost 45 percent of the area included in the Prairie States Forestry Project. New soil conservation districts are being formed rapidly within the remaining 55 percent of the area and indications now are that within a year and a half after the war between 60 and 80 percent of the Great Plains probably will be covered by locally governed soil conservation districts.

Outside of organized soil conservation districts the Soil Conservation Service is assisting farmers to establish shelterbelts to a limited extent as a part of the widespread conservation program. The Service has assisted 44,500 farmers and the Prairie States Forestry Project during its active life has helped 33,000 to establish shelterbelts.

Experience over a period of 10 years leads to the conclusion that a shelterbelt program sponsored and directed by local farmers and land owners with broad over-all federal coordination is more successful than a huge federal one-practice project. Programs sponsored by local groups under the leadership of the people who have a direct interest in the land are built upon a firm foundation. This has been proved by the Soil Conservation Districts in the Northern Great Plains during the war years of 1943 and 1944 where, notwithstanding the handicap of shortages of man power and planting stock, more than 5,000,000 trees have been planted.

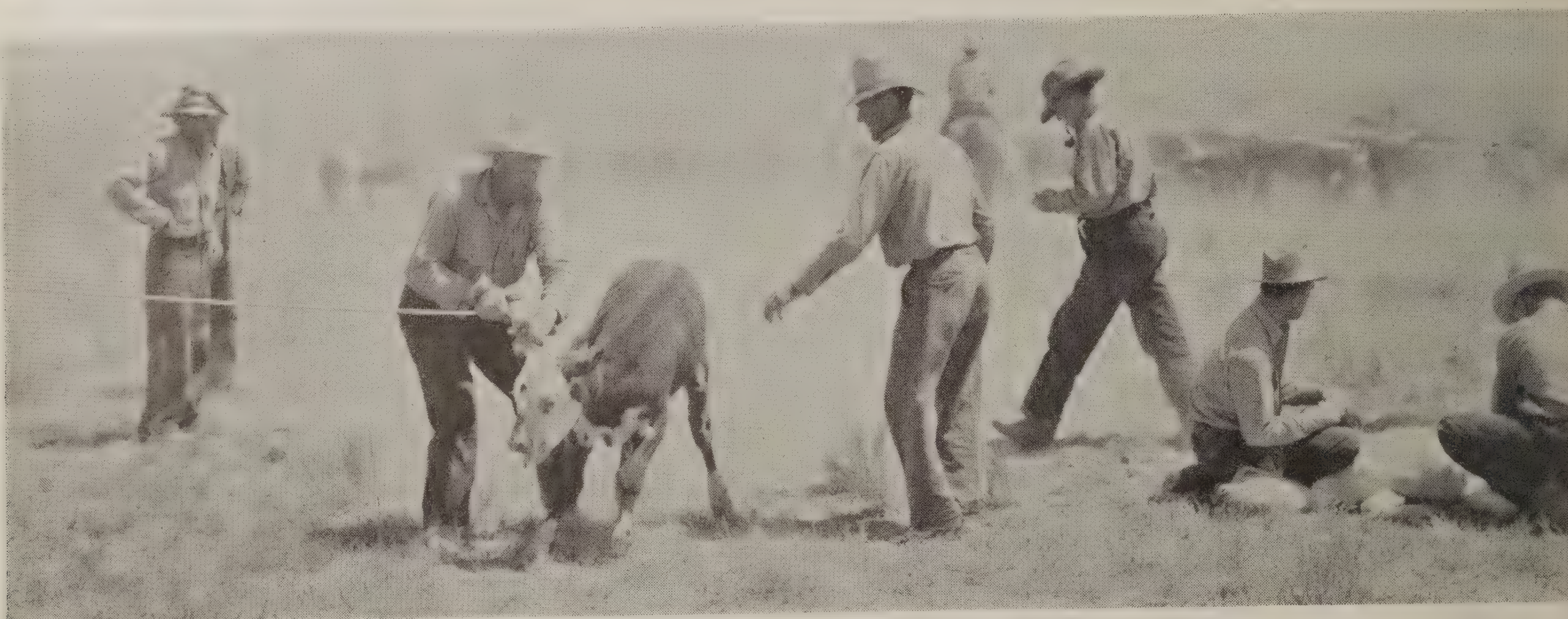
Shelterbelts are far from being a cure-all for agricultural problems in the Great Plains. They constitute but one of the many conservation practices that are being recommended. Other practices include rough tillage, crop rotations, cover crops, pasture contouring, terracing, diversion ditches, stock water tanks and ponds and many others. Correct land use, according to the needs and adaptability of the land, is essential on each farm. To give technical assistance to effect these practices is the foundation of the integrated farm conservation plan that is the basis of the work of the Soil Conservation Service, not only on the Great Plains, but throughout the United States.

Pinning Down the Sand

"The Dunes Stood Still" is the title of an article by Neil M. Clark in the April 28 issue of The Saturday Evening Post. It describes the levelling and successful regrassing of the Caddoa dunes in Colorado which permitted operation of a railroad through the area and greatly simplified a problem in war transportation.

Mr. Clark writes: "Soil experts say we have made millions of acres of deserts in this country by overplowing and overgrazing low-rainfall areas of the West. Lately the United States Soil Conservation Service gave dramatic proof that we can also unmake deserts. . . . The cost of unmaking this particular desert was $131,250. Army engineers officially estimate that if they had had to use the alternative route, the cost would have been at least $1,500,000 more."

Old West Lives Again in LU Projects



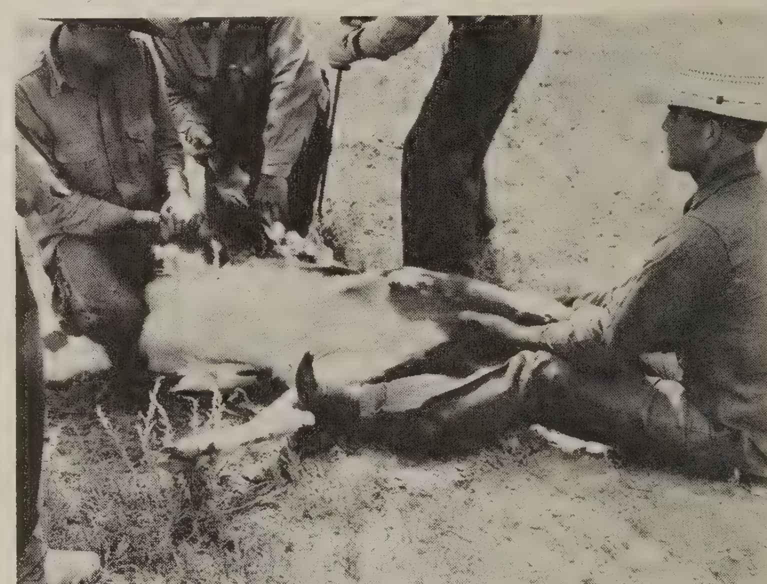
Working together, a group of livestock operators brand and vaccinate calves out on the open range. This is on one of the common-use pastures in one of the land utilization projects in the Northern Great Plains.

By O. E. McCONNELL

A tradition of the Old West was the use of rangelands in huge, unfenced areas. It may have been haphazard and uncontrolled, but the system had the advantage of flexibility. To some extent, this tradition of the Old West is being revived in the land utilization projects in the Northern Great Plains through the development of common grazing areas.

Common grazing is the term applied where two or more operators graze their livestock on the same range at the same time. Cattle belonging to several operators run at large and intermingle. Sheep are herded in bands by individual owners, or a band may be made up of several small flocks belonging to different people. Brands identify the individual ownerships. Under present land ownership patterns, not all units lend themselves to common grazing but to the extent that it is practical this plan is fostered in the land utilization projects.

Until the introduction of barbed wire fences common grazing was practiced as a necessity on the Public Domain lands before enactment of the Taylor Grazing Act. Frequently it led to bitter argument and combat between cattle and sheep operators and a consequent segregation of cattle and sheep ranges. Nevertheless, although cattle and sheep are able to thrive together on the same range, sometimes in the past their owners have been unable to do so.



Here's a well-bred youngster receiving the owner's brand and being vaccinated against disease.

In those areas which were heavily homesteaded, the open or Public Domain lands that remained were in small scattered tracts and common grazing had almost disappeared. This trend has been still further accentuated in the last few years of abundant moisture, increased vegetation, increased numbers of livestock, higher prices for livestock and plentiful supplies of ready money, following the period of drought, low prices, abandonment of lands and a heavy relief load, which have witnessed the swing by a large number of operators in the Northern Great Plains toward individual grazing allotments and fenced-in units

EDITOR'S NOTE.—The author is chief, land management division, Soil Conservation Service, Lincoln, Nebr.

—contrary to the currently popular song, "Don't Fence Me In."

The years when the Federal government had to purchase a large percentage of the livestock and furnish relief of all kinds, with lands tax delinquent in several states and going back to county ownership in wholesale lots, are still remembered by some of the people. And a considerable blocking in of units by the purchase of county and other lands is taking place. Ranchers are taking advantage of the opportunity to buy the land they need while they have the money to pay for it.

Whether common grazing or the individual-unit system is most economical in the long run seems to be of secondary importance to those men. Perhaps those ideas born of our way of life, which makes us Americans and in turn makes the United States what it is—that indescribable feeling we call independence, freedom, "mine to do with as I please"—has more to do with the individual's desire for a little domain he can call his own without undue outside interference.

The land utilization projects, however, are also furnishing the opportunity for demonstrating that people can still work together and gain the advantages of cooperation which is also a part of our way of life.

The Soil Conservation Service is custodian for 4,600,000 acres of lands in North and South Dakota, Nebraska, Kansas, Wyoming and Montana, which were purchased by the Federal government under Title III of the Bankhead-Jones Farm Tenant Act. These lands are the nucleus for 18 land utilization projects totaling 20,000,000 acres and embracing also privately-owned, county, Public Domain, and state lands. They are principally grazing and commensurate feed-base lands.

Roundup on one of the common-use pastures, preparatory to branding on open range.

Practically all of these lands, including the government-owned acres, are administered by 44 local governing bodies—grazing districts, soil conservation districts or grazing associations, organized under state law. The 156 common grazing areas which have been set up total 5,000,000 acres—1,600,000 acres of which are Title III lands. The areas vary in size from 2,000 to 70,000 acres, each accommodating the livestock of from 2 to 28 operators which totals 100,000 cattle, 150,000 sheep and 6,000 horses. Some of the grazing districts have no common grazing; in others, nearly all of the summer grazing lands are used in common. Many of these smaller operators are located so that the pasture needed for summer grazing is not available close to the headquarters. Where this is true, the common grazing area is the solution of their difficulties—a place to put their stock where it will be properly cared for, even though quite far from the headquarters.

Developments on the lands within the common grazing areas have been carried on cooperatively by the districts and Government. These include the construction of corrals in many of the common grazing areas, dams and wells and some dipping vats. It is planned to have corrals in all of the larger common grazing areas to facilitate branding, vaccinating, rounding up for shipment, and so forth. For some of the larger areas, the districts employ range riders to look after livestock and maintain the improvements. Extra district fees, above those charged by the government for the forage, are charged for the additional service where salt is furnished, riders employed and improvements maintained. All this work is necessary for handling livestock, whether it be done individually or in groups.

Increasing the quality of stock produced on the common grazing areas is centered in the bull committees provided for in each district's by-laws. The committee is either elected or appointed by the district board of directors, and usually one of its members is the county agent or some other person trained in agriculture. The other members are experienced operators. The duty of the committee is to pass upon the quality and conformation of all bulls turned into the common grazing areas. The use of inferior bulls is discouraged or not permitted in these pastures.

In some districts bulls must be registered animals of the breed decided upon by the majority of the operators using each pasture. While bulls owned by some of the better operators are of higher quality, those generally in use now in common grazing areas are average quality or better and the quality of the cattle as a whole has been increased materially. Of course, not all bull committees have made the same progress. Some are doing an excellent job; others are still somewhat lax. The present higher prices of better bulls has retarded all the progress desired in this direction. An operator, however, may use an inferior bull so long as he keeps it within the confines of his own fenced unit.

Common grazing saves much, perhaps an average of 50 percent, in fence construction and maintenance. The extent of the saving depends on the size of the common grazing area and the number of operators it accommodates. Savings in water developments are about the same. Since livestock water is one of the important limiting factors governing use of the range in the Northern Great Plains, it deserves careful consideration. In addition to the savings in the construction and maintenance of fences and reduction in the necessary number of water developments, compared with individual fenced units, common grazing permits taking advantage of better sites for water developments. Thus, better located and more dependable livestock water supplies result.

The common grazing system has some district advantages in addition to cost savings for the smaller operator. It has a tendency to get people and communities in the habit of working together, which makes for a better community in which to live. It also leads to the adoption of one breed of livestock in a community. There are several good breeds, but standardizing on one breed in a community is nearly always better than a helter-skelter intermingling of two or more breeds.

Further, grazing is better controlled with respect to season of use and degree of stocking in the common grazing areas than where the land is divided into individual fenced-in units. This better management increases the chances for continued forage production at a high level.

Last, but by no means least, the use of common grazing areas acts to protect the winter feed supplies. Usually the common grazing areas are located some distance from the headquarters, so that the stock are out of the way during the summer grazing season, which is also the growing season for feed crops. Operators, then, are free to go about the business of raising the feed needed to winter the livestock. Likewise, pasture reserved for winter use is not grazed, and is waiting for the stock when they are brought back from summer range. Too often, in individual units, pasture

The branding irons of 10 different owners are in this fire.

which should be reserved for winter is used in summer. This creates a scarcity of winter feed. The result, in many cases, is winter range used beyond the safety point and damaged, and livestock in poor condition.

Thus, through cooperation, the operator of a livestock unit is enjoying some of the tradition of the old West through cooperation with others in land utilization projects. He is, at the same time, gaining the protection arising from locally controlled use of the grasslands. And he is pointing a way for other communities who may wish to solve similar land used problems.

Purebred bulls acquired by grazing association in effort to improve quality of livestock in area.

Corrals in which to separate animals for branding, vaccinating and dehorning, and for cutting out stock to be shipped, are a regular feature of the common-use pastures on land utilization projects. Here cattle for shipping are being separated from the foundation herd.

The fern-covered areas are a constant fire hazard until converted to productive use. Some lands can be cropped or put into permanent pasture. Slopes like that in the background are often suitable for timber.

FIGHTING FERN WITHOUT FIRE

By ALBERT ARNST

In the Douglas fir region of the Pacific Northwest grows a plant that is a blessing to foresters and a curse to farmers.

It is fern (*Pteridium aquilinum var. pubescens*)—also called bracken, brake fern, western bracken and hay brake. It has no commercial value; but the successful growth of Douglas fir, western hemlock, spruce and western red cedar seedlings depends upon its shade and protection in many areas. The problem, then, is how to eradicate this troublesome plant from farmland without resorting to fire that spreads into adjacent seedling forest areas and destroys tomorrow's timber crop.

Bracken fern is an insidious and persistent resident of cutover lands and forest intermingled rural areas. It is found anywhere and everywhere in that region, chiefly west of the Cascade Mountains, and grows luxuriantly in the Coast Mountains of Oregon. It clings to farmland and pasture land with a tenacity that matches the fury of the farmer who seeks to stamp it out, and it clothes logged and burned forest lands with a dense cover which frequently tops a man's height. Tall tales are told of farmers' livestock lost in fern fields and of foresters cruising the swaying stalks, but even Paul Bunyan agreed that the plant reaches amazing heights.

The plant reproduces by means of creeping root stocks buried deep in the ground and also by spores carried in the characteristic small brown pustules on the underside of the fronds. In its proper place on forest adapted lands fern is a valuable nurse crop for tender seedlings getting started on recently logged and slash burned areas. Extended studies by foresters have shown that fern shade nurtures more trees and bigger trees. Once the trees get above the fern canopy, they eventually shade it out and finally eliminate it from the timber stand.

But fern is a menace to land use managers, particularly in soil conservation districts, because in winter and early spring it becomes a serious fire hazard. The tall stalks die out in fall and eventually are broken down by wind and rain. Crumpled to the ground in densely interlaced masses, they dry out rapidly under changing humidity and

Editor's Note.—The author is forestry specialist, Soil Conservation Service, Sedro-Woolley, Wash.

weather conditions. When tinder dry, they constitute a dreaded "flash fuel," which, when touched off by a spark, will carry fire with utmost swiftness.

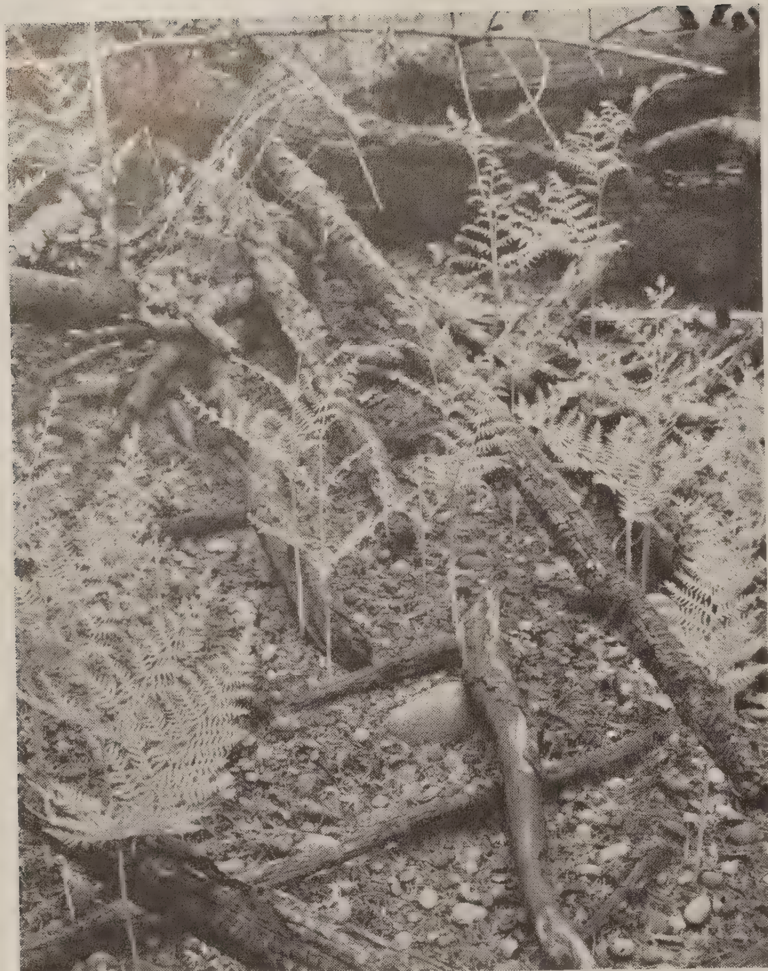
In the fire's wake may be found the thousands of little scorched trees that, unseen to the casual glance, were snuggling under the fern for protection. Fern fires also consume larger trees and destroy much wildlife. During deer fawning season, fires kill fawns, or perhaps nesting game birds, such as grouse, quail and Chinese and native pheasants. Burning fern destroys ground cover which has food value for wildlife, and it also muddies clear streams with erosion runoff. No one profits when a fern fire races across a distant slope.

Of additional interest to farmers is the fact that fern, growing or dried, is considered poisonous to horses, sheep and cattle. Sunlight seems to aggravate the poisoning effect, which results in loss of control of the leg muscles, constipation and eye pupil dilation, but causes no fever. Fern, therefore, has no place in conservation farming, because its presence on agriculturally adapted lands is a sign of improper land use.

So-called burning weather in February and March makes match-happy ranchers squint at fern fields with fire in their eye. Soil conservation districts in fern areas therefore must face fern-burning realistically, for some ranchers are potential "fernomaniacs." Statistics show that most fern fires start primarily on agricultural or assumed agricultural lands, and through carelessness, spread to nearby fields of fern-protected tree seedlings.

John Farmer generally burns fern, not to get rid of trees, but to eradicate the fern, which bothers his farming. Fire is his tool, because no one has given him a better weapon. To eliminate fern fires, the rancher must be shown a superior way to do something he will do anyway; and, furthermore, he must be convinced that on some land it is not sensible to fight fern with fire or any other method. Both the rancher's and the public's

Ferns actually nurse young seedlings like this one to the point where they can fight their own way up in the world —if they are lucky enough to escape fire.



Fire kills trees but not ferns. Lustier than ever, the ferns come back after a hot ground fire has destroyed all other growth and the surface layer of humus and duff.

appreciation of land values needs to be improved.

Each year in the Douglas fir region of the northwest, the Keep Oregon and Keep Washington Green Committees, through their cooperating agencies, carry on an active "Don't Burn Fern" campaign by press, radio and poster. A still more positive approach, equally convincing to farmer and forester, is demonstrating that fern can be banished from pasture or crop land more effectively by not using fire, and that better tree crops will mature sooner if fire is eliminated.

In soil conservation districts, soil inventories and land use capability classifications are front line weapons in the skirmish with fern burners. These indices rate the best long-time productive capacity of each farm field as determined by soil, erosion, slope and climate. They also show where crops can be grown successfully and where permanent vegetation, like trees or grasses, should replace row crops. This down-to-earth information proves it is not reasonable to develop remote "pasture" on fern covered timber growing soils, if better soiled fern land nearer the farmstead can be improved permanently with far less effort.

Fern can be licked by not using fire. On soils adapted for pasture and on tillable slopes, plow the land deeply and then harrow out, pile up and burn the rootstocks. Cultivate the land frequently during the remainder of the season or grow a row crop. Effective anti-fern treatment is the growing of oats and vetch, cut early for hay, followed by summer fallow.

Mow and clip slopes that are not too steep for handling in this manner. Run the mower over the green fern patch around July fourth and again later in the season. This bleeds the plant and retards its recovery, because the bracken is hit while manufacturing food for its buried rootstocks.

Fern burning may be sanctioned as a one-time treatment on still steeper land, if it is adapted for permanent pasture and if the rancher will follow the fire warden's advice. Burn in the fall, seed immediately to permanent grasses and pasture them when they become established. Fern-hating sod formers are used—Chewings fescue, alta fescue, creeping red fescue, highland bentgrass, orchardgrass and tall oatgrass. Annual grasses have no value for fern control.

These fern eradication techniques save trees. The field formerly torched may not have had little trees in it, but probably it bordered on a steeper slope bristling with fern-sheltered seedlings. Fire kept out of the first field also would have been kept out of the second.

Tree farmers are shown hundreds of seedlings snuggling under the dried fern. They learn that repeated fires kill all trees, impoverish soil and stimulate fern growth, because the rootstocks escape injury. They appreciate unburned fern as a nurse crop in growing timber on forest adapted lands. They know that tomorrow's timber croo may be found under today's fern patch, and that some day some community and some industry is going to benefit from the harvest of the matured trees.

Europe's Needs Reported

"The needs of Northwest Europe's liberated areas are grave, not only from a humanitarian aspect, but because they involve internal and international political considerations. The future permanent peace of Europe depends largely upon restoration of the economy of these countries, including a reasonable standard of living and employment. United States economy, too, will be deeply affected unless Northwest Europe again resumes its place in the international exchange of goods and services.—From report of Judge Samuel I. Rosenman to President Truman.

GROWING PEANUTS THE CONSERVATION WAY

This field is stripped with eight rows of peanuts and four of legumes, of which the two rows outside are crotalaria and the two inside are brabham cowpeas.

By W. M. NIXON

Peanuts, used in products ranging from soap to plastics and anti-freeze, grow best in the West Cross Timbers sector of Texas and Oklahoma when they are produced the conservation way—with a complete soil conservation program, farmers in the area have found.

The problem of producing peanuts without depleting the land of this area, which already classed as critical from the standpoint of soil blowing and washing, faced farmers when the War Food Administration first asked for increased production. The application of a complete soil conservation program for each farm has resulted in increased production of peanuts while maintaining and improving soil fertility.

Combating the potential blow-off of fertile topsoil is one of the chief problems in the West Cross Timbers. Farmers here rely on a program of crop rotation, proper management of crop residue, strip cropping, contour farming, and cover and soil-improving crops to prevent loss. Terraces are constructed on those areas where water erosion is a problem.

W. A. Maples is a cooperator with the Upper Leon Soil Conservation District. With the assistance of Soil Conservation Service technicians, he has established a complete soil conservation program on his farm, 10 miles northeast of Rising Star, Tex. This program paid off to the extent of a 70 percent increase in peanuts and an 85 percent increase in hay production in 1944.

Mr. Maples produced an average of 44 bushels of peanuts per acre in 1944 following crotalaria strips. He obtained 30 bushels per acre where peanuts followed peanuts.

Some of Mr. Maples' practices to secure better harvests include interplanting cowpeas and sorghum in strips alternating with strips of peanuts. The sorghum and pea strips afford protection against wind erosion. The peas supply nitrogen which keeps the sorghum from having a detrimental effect upon the following crop. He has used phosphate on winter cover crops of rye mixed with hairy vetch or Austrian winter peas. The cover crop was broadcast ahead of peanut digging. The hairy vetch and Austrian winter peas produce nitrogen, one of the most expensive fertilizer elements, now scarce because of its extensive use in manufacture of explosives. Mr. Maples has practiced late land preparation on deep blow sand, and he cuts his strips of sorghum stalks so they remain near the surface of the soil, forming a trashy mulch which conserves moisture and gives protection from hard rains and high winds. His experiences are typical of this area, where sandy soil, subject to severe wind erosion, predominates.

H. H. Lawson, cooperator with the Brown-Mills Soil Conservation District near Rising Star, Tex.,

EDITOR'S NOTE.—The author is regional agronomist, Soil Conservation Service, Fort Worth, Tex.

Typical of many fields of the West Cross Timbers area, where conservation measures are not used on peanut lands. After harvesting the fields stand bare and topsoil drifts to fence rows. A faint wash in the center of the field, which had been solidly in peanuts for two consecutive years, indicates both water and wind erosion.

uses a cover and soil-improving crop of rye and vetch to prevent blowing and washing. Organic matter and nitrogen are added to the soil when the crop of rye and vetch is turned under as green manure.

Mr. Lawson got 26 bushels of peanuts and 880 pounds of hay per acre from peanuts following rye alone. The peanuts following fertilized rye and vetch produced 44 bushels per acre and 1,628 pounds of hay. While the yield from the peanuts following rye alone produced at an above-average rate, the crop Mr. Lawson harvested following addition of vetch and application of fertilizer showed an appreciable increase.

An effective strip-cropping system for the Texas-Oklahoma Cross Timbers section consists of 4 to 8 rows of peanuts and 4 of corn, sorghum or crotalaria.

Grain sorghum grown on the contour in strips of 4 rows alternating with 8 of peanuts gives good protection against wind erosion. A rotation is provided by moving the strips each year.

The farm of C. M. Caraway, Sr., 6 miles east of DeLeon, Tex., provides a good "before and after" example of the benefits of peanut grown the soil conservation way. Mr. Caraway is a cooperator with the Upper Leon Soil Conservation District and also is a member of the State Soil Conservation Board.

On land planted continuously to peanuts for 10 years, he harvested 7 to 8 bushels of peanuts and 10 bales of hay per acre. On a field where the soils and slopes were similar but where such practices as contour cultivation, cover and soil-improving crops, and crop rotations have been in use about 20 years, Mr. Caraway got a yield of 30 bushels of peanuts and 30 bales of peanut hay per acre.

IMPROVE GRASSLAND FOR BETTER LIVESTOCK

By R. H. LUSH

The necessity for providing sufficient food for civilians, for our armed forces, and, in so far as possible, for our Allies and the liberated peoples is self-evident. It gives new emphasis to the desirability of feeding the soil to improve grasslands. A well-fed soil produces strong plants which, in turn, contribute largely to the health of livestock. Completing the cycle, livestock and livestock products normally furnish a large proportion of the energy, the protein, the phosphorous and particularly the calcium in the average diet.

More livestock products are needed, but there is a shortage of hay, protein feed and labor with which to make the greatest production under normal methods of feeding. Of the total feed consumed by animals during the 3-year period of 1938-40, hay, pasture and other forage crops supplied approximately 60 percent. Emphasis should

EDITOR'S NOTE.—The author is pasture specialist, The National Fertilizer Association, Washington, D. C.

be given to increasing this part of the feed supply, especially for cattle and sheep, and management systems devised which would make it possible for hogs and poultry to obtain 25 percent of their feed and nearly 50 percent of their protein from grazing crops.

Experimental results are available in nearly all of the States to show this to be entirely practicable. Furthermore, the cost of producing feed in the form of pasture and hay is considerably less than the cost of producing grain, and this is especially true of the labor cost. Results of many experiments indicate that yields of pasture and hay can be increased greatly by the proper use of fertilizer and lime where it is needed, and that the increases obtained are profitable.

Of the total land area of the United States, slightly more than half is in grass, of which only 7 percent is in plowable farm pasture, slightly more than that in farm woodland pasture, and about 20 percent in other pasture. The rest is State and Federal grazing land. Of the 130 million acres of plowable pasture land most likely to be improved, 80 million are in the 31 States east of, or bordering, the Mississippi River, and in the three Pacific Coast States. These States include 65 percent of the Nation's livestock but have only 1.2 acres of plowable pasture per animal unit. Including the 100 million acres of other pasture there are only 2.7 acres per animal unit.

Millions of these acres are in areas of variable rainfall where the addition of fertilizer might not be economical in some seasons. Other millions are in the Middle West, where lack of soil fertility is presently becoming a serious problem in the maintenance of high yields. Much of the pasture acreage is abandoned cropland too poorly drained or too seriously eroded to be made quickly productive. Soil conservation surveys show that, although 398 million acres are available for crop production in the United States, 40 million of these are unsuitable and should be retired to grass and woodland; another 350 million acres of land are subject to impoverishing erosion. Abandoned and eroding cropland needs to be retired to perennial grasses or to grasses and legumes. This throws a heavier load of production on remaining crop and pasture acres.

More efficient use should be made of the present crop acreage, along with conservation of "waste" areas. Farmers need range animals of the West as well as home-raised livestock, to convert some grain and forage into highly nutritious and palatable food, to help maintain soil fertility, to distribute labor, save transportation, and to add to income. The use of pasture saves labor and protein feed, supplies adequate quantities of known vitamins and most minerals where the soil is fertile or fertilized, aids in sanitation, conserves soil and farm machinery. Moreover, pasture is usually available when needed most and is the cheapest feed for all classes of livestock.

Improvement of pastures and hayland by use of fertilizer and lime has progressed rapidly during recent years. In 1929, less than 200,000 tons of fertilizer were used on about 2 million acres of pasture and hayland; in 1942, nearly 1,300,000 tons were used on about 11,000,000 acres; 1,500,000 tons in 1944. But this is only a start. A postwar planning committee of the U. S. Department of Agriculture has suggested that nearly one-half of the total commercial plant food should be applied to grassland and other close-growing crops. The National Planning Association reports that 5 times as much fertilizer could be effectively used on pastures and haylands as in 1942.

About one-twelfth of the combined plowable pasture and hayland acreage is now being fertilized. There are millions of acres of non-plowable pasture that might be fertilized profitably. Still other millions of acres of supplementary pasture and hay crops are fertilized but little, if at all.

A compilation by the War Food Administration of many experiments with fertilizer on pasture and hay crops shows that each pound of plant food used in the form of complete fertilizer brought about an increase of from 11 to 22 pounds of dry matter and 1 to 3 pounds of digestible protein. Large increases were obtained in the Northeastern and Southern States. The chief response in the Western States was to the use of phosphoric acid. There were wide variations between States and between experiments. Each pound of nitrogen, of which there will be a large supply in the future, made possible from 14 to 20 pounds of digestible nutrients, containing 1.8 to 3.1 pounds of digestible protein—a very profitable exchange for feed.

With the high cost of labor and of legume seed, it is now desirable to prolong old legume stands by fertilizing or by reseeding with an adapted grass mixture, such as bromegrass, orchardgrass, timothy, or ryegrass. This will give additional hay and grazing, with a somewhat longer rotation. In postwar farming it may be that the quickest and cheapest way of obtaining additional feed will be to apply liberal quantities of complete fertilizer to new and old sod crops, supplemented by nitrogen top dressing. The fertilizer not only in-

creases the yield but also insures that better soil cover which aids in erosion control.

More than 40 million acres of small grain are seeded annually in the States where there is sufficient rainfall to insure profitable results from fertilizer use. It is estimated that fully 5 million of these acres are seeded primarily for grazing or hay or soil improvement. Fertilizer applied at seeding time insures a better stand, an earlier fall cover and consequent soil protection, fall grazing and, in the South, winter grazing. In general, there is less winter killing. If animals are kept off the fields in wet weather, some winter and early spring grazing can be obtained without reduction of grain yield or injury to new seedings. Feed thus obtained is cheap. It supplements permanent pasture and roughage feeding, aids in manure distribution, and for dairy cows insures better quality of milk.

Animals thrive according to the extent to which the soil supplies the essential elements to grains utilized as feed. Past emphasis has been given to the development of vegetation by crop species and tonnage yields, rather than by nutritive values. Yet, poor soils make poor feeds and unprofitable livestock. A depletion of fertility in pastures is constantly under way. Each pound of meat, each quart of milk, removes plant food from the soil.

Better nutrition should start at the grass roots, with deficiencies made up by increasing the supply of nutrients. At Joliet, Ill., a ton of bluegrass hay from a plot treated in early spring with complete fertilizer contained 435 pounds of protein and 6.4 pounds of phosphorus, as compared with 205 pounds of protein and 3.6 pounds of phosporus per ton of hay from untreated land.

When soil treatments were made in Missouri on adjoining plots, their effects were registered in sheep as differences in animal growth per unit of feed consumed and as variations in the quality of the wool. At the Georgia Experiment Station beef cows on permanent clover pasture treated with limestone and phosphate produced a 100 percent calf crop two years in succession as compared with only 50 percent of a calf crop for cows on unfertilized pasture. Almost as striking differences occurred on fertilized and untreated ranges of the King Ranch in Texas. A blind horse in Ohio grazed only to the edge of the fertilized pasture area and avoided the untreated grass. Animals have "horse sense" about feeding, but farmers have only recently become aware of the differences in feed due to soil fertility. The addition of plant food to the soil where it is necessary might be termed as livestock health insurance, as well as profitable practice.

Grain must, of course, be fed to fattening hogs and poultry, heavy-producing dairy cows, some work stock, and livestock not on farms. All other livestock can use a larger proportion of forage crops, if every effort is made to give more days of good grazing on each pasture acre, and to harvest a higher quality and yield of hay.

WATER STORAGE IN THE SURFACE SOIL

By O. R. NEAL

The matter of soil-water relationships has been the subject of extended investigations on the part of soil physicists for many years past. In Bauer's *Soil Physics* investigations on physical properties of the soil in general and on moisture relationships in particular are traced from the work of Davy in 1813 and Shubler in 1833 up to the present time. The first extensive studies on physical properties of the soil were made by Wollny between 1879 and 1898.

Wollny studied the properties of soils with a view to the effect on plants. He was able to present a reasonably accurate picture of the importance of soils and plants on the disposition of rainfall or, in modern terminology, the role of soils and plants in the hydrologic cycle. He measured the interception of rainfall by vegetation and studied the protective effect of vegetative canopy on surface soil porosity. He measured the quantities of runoff and erosion from plots of different degrees and direction of slope, with different soil and crop conditions. Lysimeters were used to study the movement of water through soil under different crops and treatments. A surprising number of recent contributions in the fields of hydrology and conservation are actually only confirmations of Wollny's original work.

During the period of Wollny's work in Germany several American investigators were concerned to a greater or less extent with soil moisture studies. The best known of these were Hilgard of California and King of Wisconsin. King is generally recognized as the father of soil physics in this country. His book entitled *Physics of Agricul-*

Editor's Note.—The author is project supervisor, Soil Conservation Service, New Brunswick, N. J.

ture enjoyed widespread popularity and is of interest at present, particularly in connection with the author's view on soil moisture and tillage problems.

Beginning at about 1900 there was a marked decrease in research and presumably in interest in physical properties of soils. From that date up to about ten or fifteen years ago, most of the soil physics work in this country was done in the Bureau of Soils. Briggs, McLane, Shantz, Buckingham and others made notable contributions during this time, particularly in the field of soil moisture properties. Briggs and his associates developed the moisture-equivalent technique as a measure of the ability of soils to hold water. They also introduced the concept of the wilting coefficient to express the moisture content of the soil at which plants permanently wilt. Veihmeyer and Hendrickson suggested the term field capacity to designate the moisture content of the soil after the rate of downward movement of added water had decreased to a very low value.

In any practical consideration of soil moisture in relation to crop growth, whether the moisture is supplied by natural precipitation or by irrigation, the field-capacity and wilting-point values are of considerable significance since they mark the upper and lower limits of soil moisture usable by plants. In any particular soil each of these values is more or less fixed as a result of the physical nature of the soil. Treatments which tend to increase the field capacity usually result in a more or less equivalent increase of the wilting point. As a result, the quantity of water that the soil can hold for use by plants is not materially changed.

When water is added to the surface soil, it moves downward only as each successive layer of soil is raised in moisture content to the field capacity. It is not possible to raise the moisture content of the surface foot, for example, by a small amount and have the added moisture distributed uniformly through the layer. Rather the added water will all be held in the top one or two or three inches depending on the amount added. In a soil weighing 90 pounds per cubic foot and having a field capacity of 35 percent, approximately 6 inches of water can be held in a surface foot of soil. If the soil were completely dry, as is rarely if ever the case, an application of 2 surface inches of water would all be held in the first four inches of soil. Under actual field conditions the moisture content at the time of water addition would be somewhere above the wilting point, with the result that from 2 to 3 inches of water would be present when the addition was made. Under these conditions 2 inches of added water would wet the soil thoroughly to a depth of about 8 inches.

> THE GIST OF IT
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> This article points out that certain moisture constants of the soil are of particular importance in connection with irrigation. The two most important are field-capacity and wilting-point. The field-capacity, for all practical purposes, represents the only moisture content that can be induced in field soils by the addition of water. The wilting-point represents the condition below which plants are unable to obtain water at a rate sufficient to support growth processes. The range between the two values represents the quantity of water that the soil can hold for use by plants.
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> It is observed that water losses by evaporation are limited largely to moisture held in the surface layer. Attention is directed to this fact in the planning of irrigation applications.
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> Also noted are the effects of irrigation practices on physical properties of the soil, organic matter content, and general soil productivity. The need for adoption of effective conservation practices in connection with the use of supplemental irrigation is emphasized.

Losses of moisture by evaporation from the soil surface occur largely at the expense of the water held in the surface 6 to 8 inches of soil. There may be a limited amount of water lost by evaporation from greater depths but the quantity is not of great practical significance. Losses from the surface layers, however, may be high. There is experimental evidence that losses of from 0.20 to 0.25 inch per day are not uncommon when the immediate surface of the soil is wet. In a lysimeter experiment conducted several years ago two soils of quite different profile characteristics were compared in respect to quantities of water lost by evaporation. A soil that was uniformly permeable throughout the column lost an annual average of 54 percent of the precipitation as surface evaporation.

The second soil which had a relatively impermeable layer at a depth of about 9 inches lost 71 percent of the precipitation. Presumably the impermeable layer tended to hold more of the water near the surface where it was subject to evaporation. The classical experiment in this connection

was reported by Veihmeyer a few years ago. He filled containers having a depth of about 30 inches with moist soil, then exposed them to evaporation but protected them from rainfall for periods varying from 80 to 167 days. At the expiration of such periods the dry soil on the immediate surface was mixed with the underlying soil and a crop of vetch was grown without the addition of water. These results indicate clearly that evaporation losses are limited to water held in the immediate surface layers.

In agricultural operations where rainfall alone is depended upon as a source of water the foregoing information concerning water-holding capacity of the soil and the losses by evaporation are of academic interest but have no direct field usefulness since the amount and time of water application cannot be controlled. *In the case of supplemental irrigation, however, the situation is entirely different.* The rate and quantity of water application can be manipulated in whatever fashion produces the greatest economic return. In connection with evaporation losses, for example, it has been shown that water is lost in appreciable quantities from only the surface few inches of the soil regardless of the total depth of water penetration. In a particular soil a 1-inch application of water might be held entirely in the surface 5 inches where it would be subject to rapid evaporation loss. Under the hot, drying conditions that often obtain during periods when irrigation is needed, it is conceivable that a large fraction of the added water would be lost in the course of a week. When another irrigation was made the process would be repeated. Only a small fraction of the added water would be available to plants under this condition. If, on the other hand, 2 inches of water was applied at the time of the first application the depth of penetration might be 10 to 12 inches. Surface evaporation would still be limited to the surface 5 inches, more or less, and all the water below that depth would remain for plant use. The efficiency of the operation from the standpoint of quantity of water actually made available for plant use would be considerably more than doubled by this procedure. The foregoing statements concern only the efficiency of water use and do not take into account the use of labor, quantity of pipe required, rate at which water can be obtained, and other factors.

Research information is sorely needed and, to my knowledge, is not available on many of the factors involved in the practice of supplemental irrigation. The rate at which water can be applied safely to different soils under different conditions of cover is not known. Presumably it is desirable from the standpoint of the operator that water be applied as rapidly as possible without producing runoff. Time required for application of a unit quantity of water would be greater with heavy applications than with light ones. When water is first applied to a cultivated surface it is absorbed very rapidly, but the rate of entry decreases as the period of application is lengthened. In the case cited above concerning the application of 2 inches of water instead of 1 inch, the time required would doubtless be considerably more than doubled. Contouring, terracing, mulching, and other conservation practices will increase the rate of water penetration under irrigation just as they do for natural precipitation.

Information is needed on the quantity of water that can be held in the root zone of the crops that are being grown. This might vary considerably with different soils. Simple, rapid, and moderately accurate methods are needed for determining the moisture content of soils in the field in order to determine irrigation needs. Some progress has been made along this line. Plaster-of-paris blocks which are imbedded in the soil in a suitable container and can be removed for weighing offer some promise in this connection. Tensiometers are very useful for certain moisture levels but do not operate over the entire range of soil moisture from field capacity down to the wilting point. Other equipment and methods have been proposed for the measurement of soil moisture content and have been used with more or less success. There remains a need, however, for a simple field method of determining the moisture condition in the soil with respect to crop needs. Such a method, to be ideal, will be based on the newer energy-concept of moisture measurement rather than on a mere determination of weight of water per unit of soil.

In considering the developments that may be of service in connection with irrigation activities, the possible value of long-range weather forecasting should not be overlooked. We are told that great progress has been made in this science during recent years. It is not too fanciful to envisage the use of these techniques in agricultural operations. Thornthwaite and his associates have recently suggested a procedure by which deficiencies of soil moisture can be determined. In the humid areas where relatively short drought periods occur at irregular intervals it would be of great benefit to the farmers if such occurrences could be predicted with even moderate accuracy. Furthermore, accurate forecasting for short periods of only a week or more would serve as a guide for irrigation.

In any discussion of irrigation problems the need for conservation practices should be strongly emphasized. It has been shown repeatedly that the deterioration of soil structure and the exhaustion of organic matter are responsible, in large part, for increased erosion on our crop lands. The very nature of the irrigation practices is such that these deteriorative processes will be accelerated. In our efforts to encourage the maintenance of a good supply of organic matter in the soil, we sometimes lose sight of the fact that the decomposition of organic matter is a normal and desirable process. The following is quoted from an earlier statement on this subject:

"Organic-matter decomposition, with the resulting liberation of plant nutrients, is desirable and necessary under average conditions in order to maintain the soil in a well-aggregated condition which is resistant to erosion and in order to maintain a productive condition. The accumulation of a large amount of organic material that was highly resistant to decomposition would not necessarily contribute to good physical condition of the soil and to soil fertility. The desirable condition is one where a system of crop and soil management is so arranged that additions of good quality organic materials are made at regular intervals. The normal decomposition processes that contribute to good physical condition of the soil and to high productivity can then proceed without danger of the eventual exhaustion of soil organic supply."

The need for soil management practices which will maintain organic matter is increased when irrigation is practiced. The maintenance of a favorable level of soil moisture during periods that, without irrigation, would be characterized by drought tends to increase the rate of organic matter decomposition.

Contouring, terracing and other mechanical conservation practices are highly desirable to prevent runoff both from irrigation water and from precipitation. Damage from runoff and erosion on some irrigated areas is serious. The quantity of irrigation water needed and consequently the expense of application is reduced as measures for more effective conservation of natural precipitation are adopted. It is conceivable that the apparent need for irrigation on many areas would be completely eliminated by the adoption of effective practices for the conservation of natural precipitation. Certainly, in view of both the immediate and the long-time benefits involved, adequate conservation practices should accompany the irrigation process.

ACADEMICIAN T. LYSENKO ON PLANTING OF WINTER WHEAT AND RYE IN UNPLOWED STUBBLE

Excerpts from "What is the Essence of Our Proposal Regarding Planting Winter Crops in Stubble in the Steppes of Siberia" By Acad. T. Lysenko, pp. 25-36, Sotzialisticheskoe Khoziaistvo, Vol. 5-6, 1944

Translated and Abstracted
By D. B. KRIMGOLD

Subject of lively discussion among soil conservationists of late has been the question "To plow or not to plow" Faulkner's debatable book, "Plowman's Folly," has released a flood of discussion. The pros and cons have flown thick and fast. This book has served to focus attention on a fundamental operation of farming and has spurred an interest in a topic long due more general attention. Research scientists of the Soil Conservation Service have for a number of years been investigating various methods of planting crops without subjecting them to unnecessary dangers of erosion. They have developed the so-called stubble mulch farming and have worked out a large number of variations of the "trashy cover" idea for use under a wide range of conditions.

Conservationists generally, and especially workers in the winter wheat regions of the United States, will therefore be interested in the discussion of a related subject by Academician Trofim Lysenko whom a national magazine includes among "some of the world's great contemporary scientists."

The first interesting thing about Lysenko's article is that it shows that he, the great Lysenko, is definitely on the defensive and must overcome the objections and criticisms of lesser lights. He begins his discussion thus:

"The question of planting winter crops on unplowed stubble in the prairie regions and the open sections of

EDITOR'S NOTE.—The translator is soil conservationist (research), Soil Conservation Service, Washington, D. C. The magazine "Sotzialisticheskoe Khoziaistvo" is the official organ of the Narkomzem (Department of Agriculture of the U. S. S. R.).

Siberia, Transural, and northern Kazakstan is one of national economic significance. Yet this problem faces a negative and often hostile attitude on the part of a number of agricultural workers and scientists and of agricultural agencies. This affects in certain measures the yields of cereals in these regions.

"Without entering into the essence of the difference between my proposal and the old well known method, I shall enumerate the basic reasons which are commonly given for low yields of crops planted on unplowed stubbles. These reasons are:

"1. During dry summers it is hard to obtain germination of winter crops on poorly plowed fallow. It therefore follows that for crops planted in stubble, (that is, in fields which are not worked at all after the harvest) there would certainly be poor germination. On such plantings germination can be obtained only in years with ample rainfall during the latter half of summer.

"2. Winter wheat in the prairie regions of Siberia seldom winters well even on well worked and early plowed fallow. Rye comes through well on 'black' early fallow but on late fallow, which is plowed immediately prior to planting, even rye does not winter well. Therefore, planting on fields which are not plowed at all, that is plantings in stubble would fail even worse.

"3. Plowing to a depth of not less than 20 centimeters (about 8 inches) safeguards the field from infestation by weeds. Shallow plowing on the other hand causes serious infestation. Therefore, crops planted in unplowed stubble would be infested even more.

"4. During dry summers, winter crops often suffer from lack of moisture even when planted on good black early fallow. It therefore follows that during dry years crops planted in stubble will die out altogether. This is because the moisture on such fields was not allowed to accumulate but on the contrary was being exhausted by the preceding crops.

"5. Plants feed on minerals. For proper activity of the micro-organisms which mineralize organic substances it is necessary to have air in the soil. In the absence of air there will be no plant food and the plants will starve. Working over the soil produces favorable conditions for the access of air. From this it can be concluded that crops in stubble will certainly starve. On such fields the plants will be small and will produce inferior grain.

"All the explanations brought forth above are, as far as I know, widely accepted among workers in agricultural science.

"Until the fall of 1941, I did not doubt a single one of the accepted explanations of low yields obtained from crops planted in unplowed stubble. However, in the winter of 1941 and spring of 1942 my observations of winter conditions in open unprotected fields led me to a firm conviction that in the Siberian prairies planting on fallow does not present the best conditions for wintering of crops.

"Winter wheat on fallow seldom makes a crop in the Siberian prairies because it is as a rule winter killed. It is for this reason that winter wheat is not being sown in Siberia. Rye if sown at the proper time on good fallow fields will stand the winter but even rye winters poorly or does not come through at all when sown in fields plowed too late. A number of detailed observations led me to suppose that in open sections of Siberia the best winter conditions are assured when winter crops are planted not in fallow but in stubble. At the same time the study of winter conditions in Siberia led to the conclusion that the favorable winter conditions which exist on fields in stubble can not be produced on large fallow fields.

"By the spring and summer of 1943 it became obvious that the results of the experimental seedings of winter wheat in stubble carried out under my direction on the fields of the Siberian Experimental Institute for Cereal Crops, as well as the data on yields obtained from trial seedings on several state farms, exceeded our expectations. Seedings of the more frost-resistant kinds of winter wheat on good fallow field without snow arresters were entirely lost, which is as should be expected. The highly frost resistant rye (Omka) which was planted in September was either badly affected or entirely killed. At the same time plantings in stubble of all types of winter wheat, the majority of which were of the Odessa and Crimean types which are of low frost-resisting quality, all came through the winter in excellent condition. Furthermore, on the fields of the Tcheliabinsk station and at Omsk even sprouts of spring wheat wintered over satisfactorily.

"Observations of the growth of plants and data on yields in stubble planting have shown something that we did not suspect when the experiments were started. The results demonstrated that the old, commonly accepted explanation of low yields of rye planted in unplowed stubble in Siberia were not at all valid. The causes of low yields of rye planted in unplowed stubble are entirely different and can be eliminated. Planting in stubble has always been done by the broadcast method. In spite of multiple harrowing the rye seed was worked into the soil very poorly. The seeds of weeds which require only shallow depth were worked in much better with the harrow than were the seeds of rye. As a result, such broadcast seedings came up too late in the fall. This was especially true under conditions of drought. In the spring and summer of the following year the rye was crowded out by weeds. The horse-drawn drills were also inadequate for working the rye seed into the soil. It is only with tractor-drawn drills that rye can be well worked into the soil. With this method the seeds of weeds which lie on the surface of the ground remain in an unfavorable condition, that is, they are not worked into the soil. Such in-stubble seedings in the prairies of the Siberia not only of winter wheat but also of rye can, as the experiment showed, give yields not lower and in general even higher than the yields of crops sown on fallow and certainly much higher than the entirely unsuitable seedings of rye on fields freshly plowed in September, a practice which unfortunately has recently been widely followed in Siberia. The availability of good tractor-drawn disk drills has made it possible to advocate the old and discarded method of planting in stubble as the better method both agronomically and economically for the prairie regions of Siberia.

"Our proposition is that in the prairie regions of Siberia the planting of winter crops should be carried on in the stubble of spring crops which, in turn, were planted on fallow or sod. Winter wheat must be planted in the last third of August and not later than the first of September. Rye must not be planted later than between the fifth and tenth of September. The crop must be drilled with an adequate tractor-drawn disk drill by the criss-cross method. Tractor-drawn drills with suitable disks and springs can work in the seed properly, while leaving the stubble unbroken and without working in the seed of weeds which lie on the surface. Under Siberian conditions with the great range in day and night temperatures at the end of

August and the middle of September the heavy dew makes possible a stand even with the small amount of precipitation. It is only necessary that the seeding in stubble be done at the proper time with adequate tractor-drawn drills. Crops put in late, that is, in September and especially late in September, can not give a stand even if the crop is put in with tractor-drawn drills and even with good moisture condition. This is because of the low temperature. The results of the tests have already shown that planting in stubble gives the best guarantee against winter killing. It is therefore incorrect to say that stubble plantings of rye in the Siberian prairies are spotty and weak because the plants are killed by frost. The real reason for it is the broadcast method of sowing which, especially when done late, results in a spotty stand and causes the fields to become infested with weeds.

"Both science and experience have unquestionably proved that shallow plowing causes weed infestation. It would naturally appear at first glance that planting of winter crops in unplowed stubble carried on by the method which I propose would cause greater infestation by weeds."

"In my opinion, good stubble seedings of winter wheat and especially of rye made with tractor-drawn disk drills by the criss-cross method are not only not causing infestation but to some extent appear to be clearing fields from a number of weeds. This does not mean, however, that planting in stubble should be carried out on infested fields. On infested fields no method will give good results.

"It is our deep conviction that the proposed method will in the near future find wide application in the prairie regions of Siberia as a means of obtaining a cheaper supply of winter rye and at the same time improve fertility of the soil for crops that follow. This method of planting will be a useful means for combating soil erosion which, for a number of reasons, is an item of outstanding importance. Finally, the method which we propose makes it possible not only to prevent the loss by winter killing of a large proportion of frost resistant rye, but also opens up wide possibilities for winter wheat."

In the last paragraph Lysenko warns against misapplication of his method. He states:

"I want to emphasize that our proposition applies only to prairie and open timber-prairie regions of Siberia Transural and Northern Kazakstan. We do not recommend it in other regions, on fields surrounded by forests and therefore protected from wind."

REVIEWS

THE FARMER AND THE REST OF US. By Arthur Moore. Little, Brown & Company, Boston 6, Mass.

This book, by the editor of the Daily Pantagraph of McLean County, Ill., in the heart of the Cornbelt, may not have been intended for the farmers, but certainly many of them will read it with interest. This volume of slightly more than a couple hundred pages is intended for "the rest of us." It is a plea to those of us on paved streets to understand and to begin acting on our most pressing problem, namely, food.

Arthur Moore, the author, is rural enough to recognize the fact that food is fabricated soil fertility, and therefore a product of the farmer's industry. He is also industrial enough to appreciate how we succeeded in bringing on our high production per individual. His broad concepts enable him to discuss the two constituents of American democracy, namely, the farmer and industry, for the elimination of class strife between them and for the good of the cause of food production on the farms. His discussions of their interrelations ought to serve as an awakening experience to any city reader.

The American Farmer's passion for high prices, according to Mr. Moore, has moved farmers to town, has encouraged farm tenancy and has given the Nation its loss of soil fertility, the farmer his loss of security, and all of us the loss of a social democracy. Industrialism has gone forward, but at the cost of the soil body by erosion, as well as of its food-producing power by exhaustion, and of the human resources of the country areas. The cry for cheap food for the rest of us has been an industrial boomerang. It reduced the farmer's capacity to buy industry's products and led us into a depression with its destruction of food and fiber while some people were clamoring for them under Federal aid. The facts, this book points out, demonstrate our need for more than an agricultural economic policy, in the form of a distinctly national food policy.

This book is just what Mr. Moore intended it to be. It is a search "through industrial society for the core of facts about agriculture's relation to the rest of society." It has identified "the thorns and thistles," including both "those which flourish in Washington" and those "which have taken root on the land itself, in the mind of labor, and in industrial management." It analyzes clearly the fallacy in the common belief that "farming is a business" and suggests that "if business would look to agriculture for guidance it might settle its basic controversies, once and for all, in favor of the production man and against the manipulator of finance." In a hungry world profit is not the goal of farming. In terms of food, the farmer can not believe that he produces one hog too many. In terms of economics he is told that he does. Fundamentally, his calling is endowed with more than bookkeeping. It is, Mr. Moore says, "without a counterpart in business, trade or the professions. If we finally hit on a philosophy of farming which will protect our food resources," he says, "it will have to have much of farming's own unique character."

This book puts soil conservation on a new and higher plane, supports this activity in its bidding to become a part of a national food policy. Conservationists of any category will subscribe to his belief that "in soil conservation the people are first and the soil is second," that "we need technicians, but first we need farmers who want technicians," and that "to preserve the land, the farmers —not town-dwellers with their romantic and sentimental illusions—but farmers themselves must believe life on the land to be worth preserving."

The book is another of the recent testimonies that America is now thinking about her soil and the future food production from it. Mr. Moore has thought clearly, written forcefully but sympathetically. His fine style in writing about so universal a concern as food and food production should get a hearing from "the farmer and the rest of us." —*W. A. Albrecht*

REFERENCE LIST ☆☆

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SOIL CONSERVATION SERVICE

Conservation of Wildlife: Statement of Dr. Edward H. Graham, Chief, Biology Division, Soil Conservation Service, Department of Agriculture; Accompanied by Philip F. Allan, Assistant Chief, Division of Biology, Soil Conservation Service, Department of Agriculture. Division of Biology. Reprint from House Document No. 20. November 27, 1944.

Certain Hydrologic and Climatic Characteristics of the Southwest Region. Regional Bulletin No. 98, Engineering Series No. 9. Soil Conservation Service, United States Department of Agriculture. Region 6. Albuquerque, New Mexico. April 15, 1945. Processed.

Effects of Soil Erosion on Navigation in Upper Chesapeake Bay. Reprinted from The Geographical Review, Vol. XXXV, No. 2. Soil Conservation Service. April, 1945.

Federal-State Cooperative Snow Surveys and Irrigation Water Forecasts for Oregon, April 1, 1945. Division of Irrigation, Soil Conservation Service, United States Department of Agriculture with the cooperation of Oregon Agricultural Experiment Station. April, 1945.

Federal-State Cooperative Snow Surveys and Irrigation Water Forecasts for Utah, April 1, 1945. Division of Irrigation, Soil Conservation Service, United States Department of Agriculture, Utah Agricultural Experiment Station in cooperation with U. S. Forest Service, U. S. Geological Survey, and U. S. National Park Service. April, 1945.

Sediment Complicates Flood Control. Soil Conservation Service, United States Department of Agriculture. Reprinted from Civil Engineering, Vol. 15, No. 2. February, 1945. Processed.

OFFICE OF INFORMATION U. S. DEPARTMENT OF AGRICULTURE

A Guide to Conservation Practices for Ohio. AIS-16. War Food Administration, Agricultural Adjustment Agency. April, 1945.

Physical Land Conditions in Kent Soil Conservation District, Maryland. Physical Land Survey No. 37. Soil Conservation Service, United States Department of Agriculture. 1945. 15¢. [1]

A Post-War Foreign Trade Program for United States Agriculture. AIS-15. Interbureau Committee on Post-War Programs, United States Department of Agriculture. April, 1945.

Potato Production in the Northeastern and North Central States. Farmers' Bulletin No. 1958. Division of Fruit and Vegetable Crops and Diseases, Bureau of Plant Industry, Soils, and Agricultural Engineering, Agricultural Research Administration. September, 1944. 10¢. [1]

Rural Electrification After the War. AIS-11. Interbureau Committee on Post-War Programs, United States Department of Agriculture. February, 1945.

Some Plain Facts about the Forests. Miscellaneous Publication No. 543. Forest Service, United States Department of Agriculture. April, 1944. Slightly Revised March, 1945. 10¢. [1]

Some Questions . . . and Answers on Where and How to Get a Farm. AIS-19. Bureau of Agricultural Economics, United States Department of Agriculture. April, 1945.

The Work of the U. S. Forest Service. Miscellaneous Publication No. 290. Forest Service, United States Departmen of Agriculture. January, 1938. Revised January, 1945. 10¢. [1]

STATE BULLETINS

Economic Land Classification in King and Snohomish Counties, Washington, and Its Influence on Full-Time Farm Returns. (Revised). Washington Agricultural Experiment Station, Pullman, Washington. 1944. Processed.

Fifty-Sixth Annual Report. Georgia Experiment Station, Experiment, Georgia. 1943-44. 1945.

Gains on Steers on Native and Reseeded Pasturage: Second Experiment October 13, 1943, to October 31, 1944. Texas Agricultural Experiment Station, A. & M. College of Texas, College Station, Texas with the cooperation of the Soil Conservation Service. Progress Report No. 924. 1945. Processed.

Grain Sorghums Under Irrigation In the Wichita Valley. Progress Report No. 936. Texas Agricultural Experiment Station, A. & M. College of Texas, College Station, Texas. March, 1945.

Important Perennial Weeds in Montana: Their Idenification and Control. Bulletin No. 426. Montana State College, Agricultural Experiment Station, Bozeman, Montana. January, 1945.

Irrigated Pastures for Central Washington. Bulletin No. 319. The State College of Washington, Pullman, Washington. January, 1945.

Kaimi Spanish Clover for Humid Lowland Pastures of Hawaii. Circular No. 22. Hawaii Agricultural Experiment Station, Honolulu, U. S. A. February, 1945.

Kudzu in Texas. Progress Report No. 927. Texas Agricultural Experiment Station, A. & M. College of Texas, College Station, Texas. January, 1945.

Michigan's 1945 Crops Program. Bulletin No. F-69. (Revised). Extension Service, Michigan State College, East Lansing, Michigan. January, 1945.

Mississippi Farm Research. Vol. 8, Nos. 1, 2. Mississippi Agricultural Experiment Station, College Station, Mississippi. January, February, 1945.

Montana Insect Pests, 1943 and 1944; Thirtieth Report of the State Entomogolist. Bulletin No. 425. Montana State College, Agricultural Experiment Station, Bozeman, Montana. January, 1945.

Plant Propagation. Press Bulletin No. 544. Georgia Agricultural Experiment Station, Experiment Georgia. March, 1945.

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[1] From The Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.

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